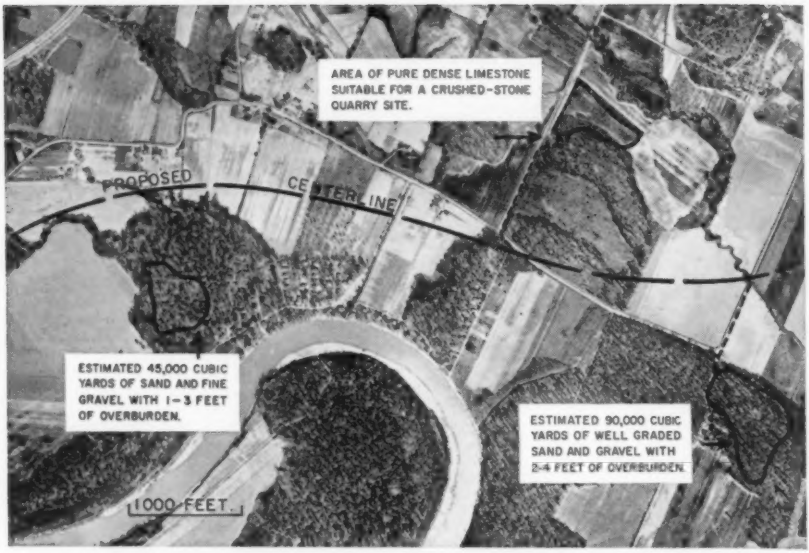
Surveying and Mapping

526
TR-2

July — September 1958

Quarterly Journal

AMERICAN CONGRESS ON SURVEYING AND MAPPING


AREA OF PURE DENSE LIMESTONE SUITABLE FOR A CRUSHED-STONE QUARRY SITE.
PROPOSED
CENTERLINE
ESTIMATED 45,000 CUBIC YARDS OF SAND AND FINE GRAVEL WITH 1-3 FEET OF OVERBURDEN.
ESTIMATED 90,000 CUBIC YARDS OF WELL GRADED SAND AND GRAVEL WITH 2-4 FEET OF OVERBURDEN.
1000 FEET

Prospecting for construction materials. Interpretation rapidly uncovers all available sources. Potential quarry sites, and sources of borrow and granular materials are mapped . . . evaluated for quality, quantity, overburden and accessibility.

Get basic soils and geologic data from AERO photo interpretation

Now you can obtain essential soils and geologic data for the pre-boring stages of engineering projects with dependable AERO photo interpretation studies.

AERO'S staff of engineers and geologists develop basic engineering data from detailed air photos. For example, soils are mapped according to their engineering properties: *texture, plasticity, bearing capacity, and internal and external drainage. Generalized profile is indicated.*

Area geology is mapped also, according to engineering properties. AERO'S reports include: *estimates of difficulty of excavation, susceptibility to slides, dip of bedded rock, and rock type.* Where hydraulics are involved, *faults and joints are mapped, areas of solution channels indicated, and estimates of porosity made.*

In addition, AERO reports on location of construction materials, location of trouble areas, and determination of depth to bedrock.

For more information on how AERO photo interpretation can provide data at substantial savings in time and cost, write us today. Ask for our new folder "Air Photo Interpretation of Soils & Geology for Engineering Projects."

AERO SERVICE CORPORATION

Oldest Flying Corporation in the World

210-A East Courtland Street, Philadelphia 20, Pa.

Organization of the Congress

OFFICERS FOR 1958

President
WILLFRED B. WILLIAMS
Grand Rapids, Mich.

Vice President
GEORGE C. BESTOR
Carmel, Calif.

Executive Secretary
WALTER S. DIX
Maps and Surveys Division, TVA

Treasurer
HENRY W. HEMPLE
U. S. C. & G. Survey (Ret.)

BOARD OF DIRECTORS

(Terms expire 1958, 1959)

LESTER C. HIGBEE	1958
LOREN A. BLOOM	1958
WARREN C. CRUMP	1958
CHARLES H. DAVEY	1958
ROBERT C. ELLER	1958
I. E. RITTENBURG	1958
ROBERT H. LYDDAN	1959
RALPH MOORE BERRY	1959
DUNCAN M. FITCHET	1959
VICTOR H. GHENT	1959
EVERETT D. MORSE	1959
JESSE E. MUNDINE	1959

PAST PRESIDENTS

ROBERT H. RANDALL
JOHN S. DODDS (Deceased)
GEORGE D. WHITMORE
FRANK S. BORDEN
MARSHALL S. WRIGHT
SOL A. BAUER
GERALD FITZGERALD
GEORGE H. HARDING
REAR ADM. R. F. A. STUDDS
CARROLL F. MERRIAM
LESTER C. HIGBEE
ROBERT H. LYDDAN

CHAIRMEN, TECHNICAL DIVISIONS

GRANVILLE K. EMMINIZER, *Cartography*
LANSING G. SIMMONS, *Control Surveys*
LEO V. NOTHSTINE, *Education*
CLIFFORD A. THORPE, JR., *Instruments*
A. PHILLIPS BILL, *Property Surveys*
PAGE F. HOPKINS, *Topography*

CHAIRMEN, STANDING COMMITTEES

WILLFRED B. WILLIAMS, *Executive*
JOHN M. AMSTADT, *Budget*
FRANK S. BORDEN, *Membership*
SOL A. BAUER, *Professional Status*
CHARLES A. WHITTEN, *Publications*
HELMUTH BAY, *Public Relations*

ADVISORY COUNCIL

C. C. LINDSAY
WILLFRED B. WILLIAMS
WILLIAM C. WATTLES
J. S. BEAZLEY

PUBLICATIONS COMMITTEE

CHARLES A. WHITTEN, *Chairman*
FRANK S. BORDEN (General)
R. C. BRINKER (Property Surveys)
ROBERT C. ELLER (General)
LYMAN D. LYNN (General)
C. S. MALTBY (Instruments)
MARVIN C. MAY (Education)
WALTER A. RISTOW (Cartography)
H. P. KAUFMAN (Control Surveys)
MORRIS M. THOMPSON (Topography)

NOTE:—Manuscripts of articles should be addressed to Chairman Whitten, Coast and Geodetic Survey, Department of Commerce, Washington 25, D. C.

EDITORIAL STAFF

HOWARD S. RAPPLEYE, *Editor-in-Chief*
JOHN B. ROWLAND, *Assistant Editor*
A. J. WRAIGHT, *Assistant Editor*

American Congress on Surveying and Mapping

The American Congress on Surveying and Mapping is a non-profit association, organized to advance the sciences of surveying and mapping in their several branches, in furtherance of the public welfare and in the interests of both those who use maps and surveys and those who make them. It aims to establish a central source of reference and union for its members, to contribute to public education in the use of surveys and maps, and to encourage the prosecution of basic surveying and mapping programs, especially those programs which are paid for, in whole or in part, with public funds.

SURVEYING AND MAPPING is the official journal of the Congress and is published quarterly during the months of March, June, September, and December. The Congress welcomes articles and interesting news items for publication in its journal. Manuscripts should be sent to the Chairman of the Publications Committee.

For further information, write to

EXECUTIVE SECRETARY

AMERICAN CONGRESS ON SURVEYING AND MAPPING

BOX 470, BENJAMIN FRANKLIN STATION, WASHINGTON 4, D. C.

or

ACSM Central Office, 905 Washington Bldg., 1435 G St., N.W., Washington 5, D. C.

ADVERTISING IN SURVEYING AND MAPPING

To assist members to keep abreast of new developments in surveying and mapping instruments and equipment, and to afford suppliers of such items an advertising medium ideally suited for their market, the pages of SURVEYING AND MAPPING are open to commercial advertising. For rates and data, write to SCHALER BUTLER ASSOCIATES, exclusive agents, at 1028 Connecticut Ave., N.W., Washington 6, D. C.

INDEX TO ADVERTISERS

Abrams Aerial Survey Corporation	282	The Kelsh Instrument Co., Inc.	342
Aero Service Corporation ... Cover	2	Kern Instruments, Inc.	283
Wm. Ainsworth & Sons, Inc.	360	Keuffel & Esser ... 368 &	369
Alaska Highway Division	359	Monsen Typographers, Inc.	274
American Paulin System ... Cover	4	Ottico Meccanica Italiana	370
Aqua Survey & Instrument Company	318	Park Aerial Surveys, Inc.	313
Askania-Werke A. G.	285	Raytheon Manufacturing Company	288
Bathey Manufacturing Company	280	Repro Graphic Machines, Inc.	284
Bausch & Lomb Optical Co.	281	Harrison C. Ryker, Inc.	310
Berg, Hedstrom & Co., Inc.	275	R. L. Sargent Co.	286
C. L. Berger & Sons, Inc.	277	Schaler Butler Associates	290
Bludworth Marine	359	State Boat Corporation	359
F. W. Breithaupt & Sohn	337	Surveyors Service Co.	290
Denoyer-Geppert Company	371	R. M. Towhill Corporation	289
Eugene Dietzgen Co.	320	Transograph (Div. of Chart-Pak, Inc.)	331
Fairchild Aerial Surveys, Inc.	338	Universal Instrument Co.	348
Fennell Instrument Corp. of America	371	Wallace & Tiernan Incorporated	279
Filotecnica Salmoiraghi, Inc.	287	Warn Manufacturing Co.	276
Leo Jean Goldsmith	359	Wild Heerbrugg Instruments, Inc. . Cover	3
Maurice Gould	313	Zeiss-Aerotopograph	278
W. & L. E. Gurley	272		

SURVEYING AND MAPPING is published quarterly by the AMERICAN CONGRESS ON SURVEYING AND MAPPING, Box 470, Benjamin Franklin Station, Washington 4, D. C. Yearly subscriptions to nonmembers: U. S. $5.00; foreign $6.00. Single copies $1.50 plus postage.

Entered as second-class matter at the Post Office at Washington, D. C., November 13, 1944, under the Act of March 3, 1879. Accepted for mailing at special rate of postage August 7, 1958. Additional entry as second-class matter at the Post Office at Lancaster, Pa.

SURVEYING AND MAPPING

Editor-in-Chief
Howard S. Rappleye,

A QUARTERLY JOURNAL
DEVOTED TO THE ADVANCEMENT OF THE SCIENCES
OF SURVEYING AND MAPPING

Volume XVIII, No. 3
July–September 1958

PUBLISHED BY THE
AMERICAN CONGRESS ON SURVEYING AND MAPPING
BOX 470, BENJAMIN FRANKLIN STATION, WASHINGTON 4, D. C.

ACSM CENTRAL OFFICE IS LOCATED AT 905 WASHINGTON BUILDING,
1435 G STREET, N.W., WASHINGTON 5, D. C.

Built-in optical plummets eliminate plumb bobs save set-up time...improve accuracy

Gurley OP-57

Gurley OP-137

The Gurley Optical Plummet Transit (Model OP-57) has proved itself to be such an important time and money saver in the field that this optical plummet feature has also been added to the Model 132 Standard Precise Transit. The new transit will be known as the OP-137.

Both these Optical Plummet Transits will save you time and trouble in setting over a point. The OP-57 and OP-137 eliminate the swing and sway of the cord and plummet—exasperating and time consuming. You will especially appreciate the increased accuracy on windy locations.

By rotating the instrument 180°, you can be assured of positive centering.

The Gurley Optical Plummet Transits are furnished with tripods which have built-in shifting heads. They allow a two-inch shift of instrument over the point, providing greater latitude in initial set-up.

Model OP-57 is recommended for very exacting work; the OP-137 for general engineering and construction work because of its shorter telescope, smaller size and its lighter weight.

Now in *two* models Gurley offers you an important advantage of the optical-reading theodolite *plus* the simplicity, ruggedness and proved performance of the American transit. *Write for new Bulletin OP-100.*

W. & L. E. Gurley
Engineering Instruments Division
Troy, New York
Since 1845

GURLEY

W. & L. E. Gurley, Engineering Instruments Division
530 Fulton St., Troy, N. Y.

Please send new bulletin OP-100 with details on Gurley's Optical Plummet Transits.

NAME

TITLE

ORGANIZATION

ADDRESS

CITY ZONE NO. STATE

July • Aug. • Sept. • 1958

Contents

Volume XVIII
Number 3

INDEX TO ADVERTISERS 270

COMPARISON AND COMPILATION OF STATE REGISTRATION REQUIREMENTS CONCERNED WITH THE "PROFESSION OF LAND SURVEYING" 291
Compiled by *Victor H. Ghent*

STATE LAWS DEFINING LAND SURVEYING 304
Compiled by *Victor H. Ghent*

AZIMUTH BY SOLAR-ALTITUDE OBSERVATION
HOW GOOD IS IT? 311
Ralph Moore Berry

EDUCATION FOR SURVEYORS 314
Abstracted by *Leo V. Nothstine*

THE EFFECTS OF USER REQUIREMENTS ON MAP DESIGN 315
Jacob Skop

THE NEED FOR MAP USE RESEARCH 319
Robert O. Maxson

ABOUT FINDING THE RADIUS OF A CIRCULAR CURVE 321
Michael V. Smirnoff

TRENDS IN COAST AND GEODETIC SURVEY COMPILATION 323
John M. McAlinden

SURVEYING AND MAPPING NEWS 326

THE SURVEYOR AND THE LAW 332

BOOKS IN REVIEW 339

MAP INFORMATION 343

COMMENT AND DISCUSSION 349

NEWS OF RELATED ORGANIZATIONS 352

CONGRESS NEWS 354

NEW MEMBERS 361

CONGRESS DIRECTORY 365

SUSTAINING MEMBERS 366

MEMBERSHIP APPLICATION BLANK 367

NOTICE ON ORDERING REPRINTS 367

ANNOUNCEMENT CONCERNING 1959 ASP & ACSM CONSECUTIVE MEETINGS AND CO-EXHIBITS 372

Opinions or assertions expressed in articles in this Journal do not necessarily represent the official views of the CONGRESS.

Map copyright by
Rand McNally & Company, R. L. 58S44

Fast, legible detailing

WITH MONSEN MAP TYPE

Monsen Trans-Adhesive® Map Type is prepared to your specifications. Names, numerals, symbols and small cartographic details are precisely printed on acetate. You simply place in position and burnish. A clear, pressure-sensitive adhesive backing holds each detail in place until you want it removed. Letters and symbols are razor-sharp—never leave room for misinterpretation.

FREE TYPE SPECIMEN BOOK AND SAMPLES

See typical selection of type faces and symbols. Test samples of both *Regular* and *H-R Heat Resisting*. Price list included.

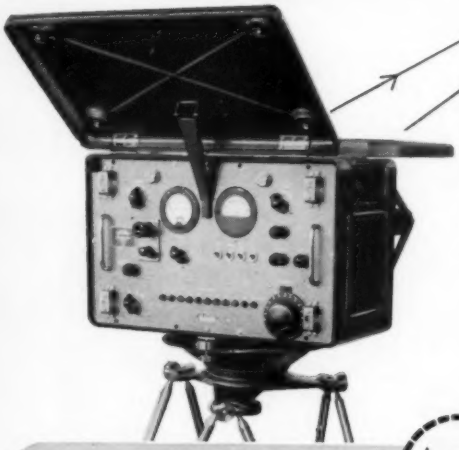
TWO KINDS: Monsen Regular Trans-Adhesive Map Type for maps and charts which will be reproduced by a "cool" method such as photography or contact in a printing frame.

Monsen H-R Heat Resisting Trans-Adhesive Map Type for maps and charts which will be subjected to heat in a Bruning, Ozalid or blueprinting machine.

Monsen *typographers, inc.*

Chicago 11—22 East Illinois Street
Los Angeles 15—960 West 12th Street

6401



REVOLUTIONARY

GEODIMETER

One Model 3 Geodimeter Saves $100,000. A Year in Highway Program

HOW THE GEODIMETER CAN BE USED

- City Surveying
- Base lines—triangulation nets
- Traverse
- Photogrammetry
- Radar Calibration
- Highway and Pipeline Surveys
- Oil Surveys
- Mine Surveys
- Offshore Hydrography

AGA

Introducing a new device for direct measurement of distance. This instrument is the result of 15 years of electronic and optical research. This is the instrument that proved the speed of light at the present accepted value 299,793.0 km/sec. The name Geodimeter is developed from GEOdetic Distance-METER.

OVERALL GEODIMETER SIZE: 21 x 14 x 12 inches

Weight:
58 lbs. for Geodimeter
22 lbs. for tripod
10 lbs. for reflector
22 lbs. for generator

ACCURACY: The model 3 Geodimeter and 2 men can measure more than 8 traverse lines in 8 hours. (Range 1 to 20 miles.) Error less than ± 4 inches or 10 cm ± two millionth of the distance. **SENSITIVITY:** The Geodimeter is so sensitive that expendable "Skotch-Lite" tape on stakes can be used to accelerate highway staking. **ECONOMY:** Only one man operates a Geodimeter, a second man moves reflectors similarly to a rodmans function. **RUGGED AND CONVENIENT:** The Geodimeter is a sensitive instrument yet it is made to be portable and is extremely rugged. **DOLLARS AND CENTS:** 4 or 5 surveyors cost you $20,000 to $35,000 per year. You can reduce this cost by one half while you double your work output.

Complete equipment includes Geodimeter, tripod, reflex system, and generator.

PROVEN RESULTS IN HIGHWAY PROGRAM USING GEODIMETER

Seven months ago the Highway Department of one of this country's largest states began a new measurement program utilizing the Model 3 GEODIMETER. This program ran through the winter under a wide range of conditions.

The results, after measuring 200 lines in excess of 600 miles in a seven month period:

- The GEODIMETER proved itself to the various district survey departments in terms of quantity and quality of works accomplished.
- By using the GEODIMETER they could now easily carry their traverses into mountains and obtain the best controls and results.
- Where a triangulation would normally be awkward it is no longer a problem, since the GEODIMETER is the only instrument which can be used in lake or narrow canyon areas.
- Time consuming and difficult adjustment of quadrilaterals has been eliminated (side shots can be trusted to a much higher degree and the traverse always closes).
- The GEODIMETER was subjected to rough handling, even dropped, without apparent effect.
- It was found that savings would run as high as 30% to 50% in level unobstructed terrain and it was felt that the savings would be much higher in mountainous or rough terrain as compared with conventional methods. Maintenance costs were found to be negligible.

THIS STATE DIVISION OF HIGHWAYS ESTIMATED THAT ON REASONABLE CONTINUOUS USE THEIR SAVINGS WOULD BE OVER $100,000 PER YEAR.

Send for complete detailed report of this program, as well as complete litertaare on the GEODIMETER

THE GEODIMETER CO. A Division of

BERG, HEDSTROM & CO., INC. 1170 Broadway, New York 1, N. Y.

SAVE ON EQUIPMENT . . .
SAVE ON REPAIRS, GAS, TIRES . . .

Install either Warn Lock-O-matics, the hubs that "shift for themselves", or get Warn Locking Hubs and "dial the drive" with your fingers. You'll never again have a 4-wheel drive without Warn Hubs!

STOP FRONT DRIVE WEAR, DRAG AND WHINE IN 2-WHEEL DRIVE!

WARN MFG. CO., Inc. Riverton Box 4064-SM9 Seattle 88, Wash.

How good should an instrument be?

Kaiser engineer sights through Berger 18" Dumpy Level under blistering desert sun on the site of Permanente's plant, designed to turn out 2,400,000 barrels of cement yearly.

Kaiser Engineers tell how

BERGER INSTRUMENTS beat desert sand and heat

Brutal climatic conditions were the order of the day, *every* day, during the construction of the huge Permanente Cement Company plant at Lucerne Valley, California. Yet, the job called for close tolerance measuring in layout of buildings and placement of machinery.

Berger levels were continually exposed to this blistering desert heat and clouds of destructive dust — conditions that would challenge the accuracy of ordinary instruments. But not Berger Instruments. Kaiser engineers put it succinctly: "They stayed in adjustment and performed perfectly, *without maintenance*, in these difficult situations."

Layouts for mill building, primary crusher, burner building and clinker cooler foundations were all done with Berger Instruments. Rough grade tolerances were held to .01 ft., base plates and equipment foundations to .007 ft. Two 12 ft. by 450 ft. rotary kilns, among the world's largest pieces of moving machinery, were installed with the aid of Berger Instruments.

Heat, sand, dust — not every job calls for such punishment. But isn't it good to know you have this extra safety factor, just in case?

That's why, where accuracy is at stake . . . any time . . . in any clime, leading engineers and construction men buy Berger. Put yourself behind a Berger — and see why.

C. L. Berger & Sons, Inc., 43 Williams St., Boston 19, Mass.

THE BEST IN SIGHT IS

BERGER

ENGINEERING AND SURVEYING INSTRUMENTS SINCE 1871

Berger 6¼" Engineers' Transit
first in engineering.
first with engineers.

THE BEST IN SIGHT IS BERGER

ENGINEERING AND SURVEYING INSTRUMENTS . . . SINCE 1871

ECOMAT

AEROTRIANGULATION AND PRECISION MAPPING

Maximum accuracy and universal applicability are outstanding features of the C 8 STEREOPLANIGRAPH and its new ECOMAT electromagnetic recording unit.

Universal photo-carriers with interchangeable lenses and correction plates allow the plotting of vertical, oblique and convergent photography obtained with any customary type of mapping camera.

Automatic recording of measuring data on punched tape or punched cards through the new ECOMAT. Further processing of data in commercial computers.

Details upon request

ZEISS-AEROTOPOGRAPH · MUNICH

München 27/Western Germany/Iamaninger Str. 57

Sole Agents for U.S.A. TRANSMARES CORPORATION, 15 William Street, New York 5, New York
2018 Columbia Pike, Arlington, Virginia

Field party on survey for proposed Canyon Dam on Texas' Guadalupe River.

TYPE FA-176

W&T SURVEYING ALTIMETERS SPEED HYDROLOGIC STUDY OF RESERVOIR BASIN

A ground-water and geologic survey, involving water table isograms for 400 square miles adjoining the proposed Canyon Dam Reservoir on Texas' Guadalupe River, recently was completed in 35 days. Despite difficult terrain and maximum relief of 1000 feet, over three hundred spot elevations were taken during this period. The speed with which this work was done is attributed to the use of the two-base method of altimetry employing three Wallace & Tiernan Type FA-176 Surveying Altimeters.

Technical data on the FA-176 Altimeter include: **Range** — any interval of 2000′ up to max. limit of 5000′; **Accuracy** — 2.0′; **Sensitivity** — 0.5′; **Scale Length** — 20″; **Dial Size** — 8½″ dia.

For details on FA-176, send for Bulletin No. A-117.88

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

In Canada, Wallace & Tiernan, Ltd. — Toronto

PROFESSIONAL PROPERTY MARKERS

"A Permanent Tamper Proof Marker"

USED BY FEDERAL, STATE, COUNTY AND CITY AGENCIES

SPECIAL CAPS

STANDARD CAPS

All identification caps are solid corrosion-resistant brass.

CHECK THESE ADVANTAGES:

- A Permanent Marker.
- Professional Advertising.
- Minimum Bulk for Storing or Carrying.
- Dip Needles Response.
- Positive Identification.
- Ideal for Hard Ground.
- Five Stake Lengths: 3", 18", 24", 36", 48".

Your clients will recognize the value of a permanently identified professional survey.

A Michigan corporation whose officers are members of the American Congress on Surveying and Mapping.

BENCH MARK

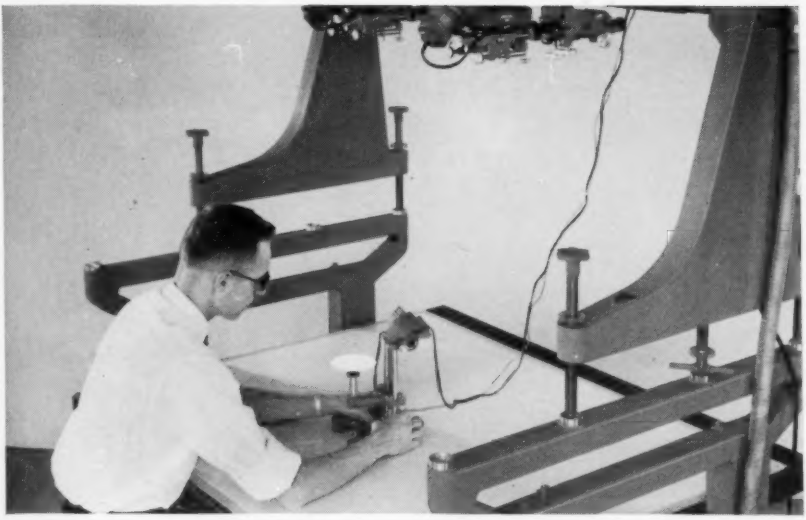
HEAD
2¼" Dia..
⅛" Thick

Permanent solid brass property markers remain tamper proof when set in concrete. Plain top or stamped to your specifications.

B-19 Bathey MANUFACTURING COMPANY

100 S. MILL ST. PLYMOUTH, MICH.

Manufactured and Sold Direct From Factory



NEW LOW-COST BALPLEX 760 SPEEDS HIGHWAY MAPPING

Here it is . . . the new aerial plotter specifically for highway and other large scale mapping. Now you can plot accurate large scale maps with small contour intervals . . . quickly and easily . . . with an investment of approximately $5000!

HIGH ACCURACY—LOWEST CAPITAL COST—New Balplex 760, complete, only $4950. Balplex 525 prices start at $4600.

LOWEST COST PER MAP—Plots larger areas from fewer photographs taken at greater heights.

FAST, SIMPLE—Standard Multiplex operation, saves training time. Handles weeks of ground work in a few days!

MAIL COUPON FOR COMPLETE DATA

Bausch & Lomb
BALPLEX
PLOTTER

BAUSCH & LOMB OPTICAL CO.
37733 St. Paul St., Rochester 2, N. Y.

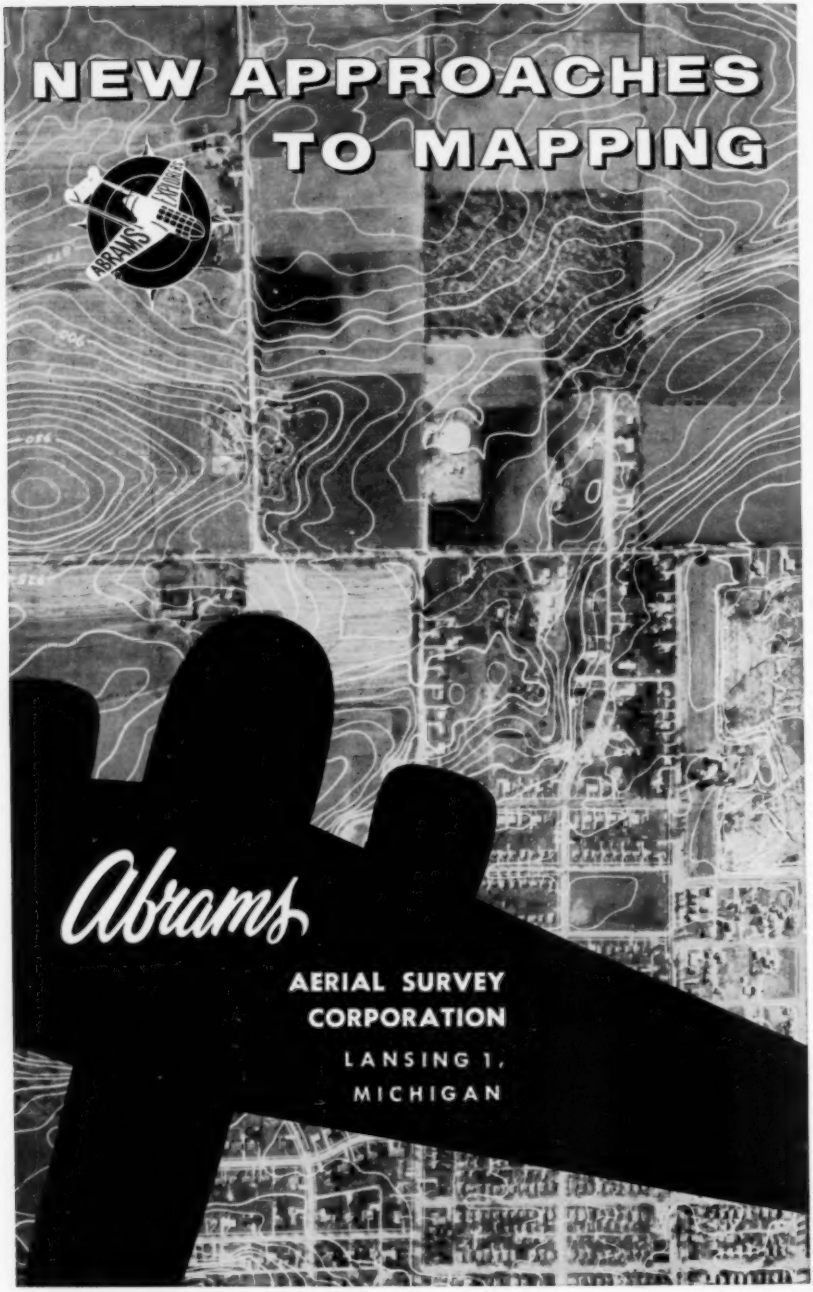
☐ Send information on Balplex 760 Plotter
☐ Send information on Balplex 525 Plotter
☐ Send information on Multiplex 360 Plotter

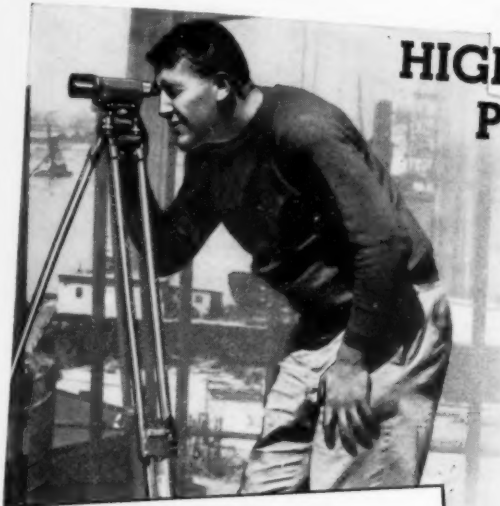
NAME .....

TITLE ..... COMPANY .....

BUSINESS ADDRESS .....

.....


NEW APPROACHES
TO MAPPING
ABRAMS
Abrams
AERIAL SURVEY
CORPORATION
LANSING 1,
MICHIGAN



HIGH PERFORMANCE KERN SURVEYING INSTRUMENTS

. . . preferred when the job calls for high standards of

EFFICIENCY in ACTION

★ Precision
★ Speed ★ Economy

KERN NK3 LEVEL

in use at Gloucester Anchorage of new Delaware River Bridge, to be known as Walt Whitman Bridge, under construction by Delaware River Port Authority of Pennsylvania and New Jersey. (Modjeski & Masters, Ammann & Whitney, Consultants to the Delaware Bridge Authority of Pa. and N. J.

KERN instruments are also on the job at the new 25-mile Lake Pontchartrain Bridge being built near New Orleans.

KERN INSTRUMENTS

KNOWN THE WORLD OVER for

- Fast: Effortless Operation
- Functional: Down-to-Fundamentals Compact Design
- Portable: Minimum Set-up Time
- More Accurate Results in Shortest Possible Time
- Exceptional clarity of optical system—50% brighter image and sharper contrast with Kern AR coating

For Detailed Information Request Booklet NK 3-6

PROMPT, RELIABLE SERVICE • FACTORY TRAINED PERSONNEL

★

Kern and Only Kern Offers You the Latest Designs of Dr. Henry Wild

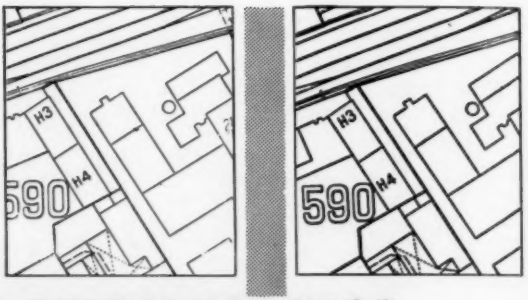
Kern SWISS

The FINEST in SURVEYING EQUIPMENT

KERN INSTRUMENTS INC.

120 GRAND STREET
WHITE PLAINS, NEW YORK

LINE WEIGHT PROBLEMS



IN MAP REPRODUCTION??

KLIMSCH VARIOMAT Line Variator

(U.S. Patent No. 2,776,595)

Lensboard accessory adaptable to almost any type horizontal reproduction camera

Manufactured by:

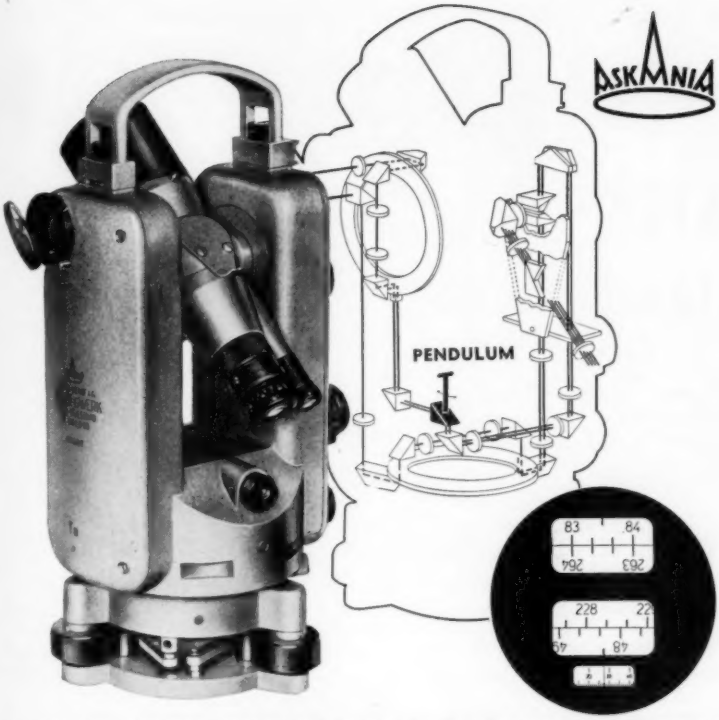
KLIMSCH & CO., FRANKFURT-MAIN, WEST GERMANY

Write for Complete Information

Factory Agent and Distributor:

REPRO GRAPHIC MACHINES, INC.

180 VARICK ST. NEW YORK, N. Y. CHelsea 2-5255



A NEW HIGH PRECISION SURVEYING INSTRUMENT
of sturdy construction

ONE-SECOND THEODOLITE Tu-e

Embodying as new advantageous, time saving feature the
Self Adjusting Vertical Circle Index.
Erecting Telescope:

Telescope	magnification	30 x
	effective aperture	1.8 in.
Shortest foscussing distance		7 feet
Glass circles	graduation	1/3°
	direct reading to	1″
	estimating to	0.1″
Levels	plate level	20″/2 mm
	circular level	10′/2 mm

PRICE US $1295. — FOB BETHESDA, TRIPODS EXTRA

Write for booklets E 1800b and E 1882/83

ASKANIA-WERKE A. G. • U.S. – BRANCH OFFICE
4913 Cordell Ave., Bethesda, Md. • Distribution—Full factory services

Presenting . . .

The KERN NK3 Level

"Truly to-morrows level today"

The ULTIMATE in QUALITY & PRECISION

yet priced competitively with levels of less modern design & accuracy.

Catalogs giving complete descriptions and prices of the NK3 as well as other modern instruments of the KERN Line, will be gladly sent on request.

Remember—"There is no better way to call attention to yourself and your progressive engineering techniques—than to use a Kern surveying instrument."

SURVEYING INSTRUMENT REPAIRS

We have the most modern, newly and completely equipped instrument repair shop in the south. Our equipment includes the best factory designed collimators for adjusting in this part of the country, also we have new microscope equipped devices for centering horizontal limbs and verniers, special mandrels, taps and dies and other fixtures and tools for the factory type repair of your instruments. Our supply of parts are all new and factory made. We do not "cannibalize" old instruments for parts or use any old worn material in our repairs. We have new factory parts for most popular makes of instruments—and our prices are consistent with the quality of the work performed. We can give as prompt service as the magnitude of your repair job will allow.

Southern KERN Distributors

R. L. SARGENT CO.

M & M BUILDING Telephones: CA 8-5879 CA 8-5880 HOUSTON 2, TEXAS

ENGINEERS & SURVEYORS INSTRUMENTS
SALES — RENTALS — REPAIRS
INSTRUMENTS BOUGHT & SOLD
STEEL TAPES, RANGE POLES, LEVEL RODS

"Instruments sold and repaired by the R. L. SARGENT COMPANY are in service all over the world."

FILOTECNICA SALMOIRAGHI was founded in 1865 in Milano, Italy, as a training and research center for Optical Engineers.

Experimental work quickly led the organization into the field of specialized manufacturing of precision surveying, engineering and optical instruments.

Today, each unit of the F/S line of *Levels, Theodolites,* and *Planimeters* embodies features developed during the Company's 93 years of research and manufacturing experience.

F/S PRECISE
AUTOMATIC LEVEL
Model 5190
A suspended unit levels automatically the line of sight within 0.3 seconds from the true horizontal. Time is cut to ⅓, since the automatic unit operates after just roughly centering a bull's eye level and there is no sensitive vial requiring corrections for thermical variations.
• Periscopic Telescope, ctd. optics
• Erect images, 30X magnification
• Built-in Micrometer to .0001 ft.
• Accuracy to.0013 ft. per mile
• Servicing by factory specialists
F/S offers a complete line of high quality engineering instruments. Ask your nearest dealer or write today for detailed literature.
FILOTECNICA
SALMOIRAGHI, INC.
41-14 24th St., L. I. C. 1, N. Y.
Dealers Inquiries Invited

F/S DISTRIBUTORS: The A. Lietz Co., San Francisco and Los Angeles, Calif.—National Blue Print Co., Chicago, Ill.—Watts Instruments, Columbus, Ohio—Geo. F. Muth Co., Inc., Wash., D. C.— CANADA: Instruments 1931 Ltd., Ottawa, Toronto, Regina, Montreal.

RAYTHEON HAS BUILT MORE DEPTH SOUNDERS THAN ANY OTHER COMPANY IN THE WORLD

NOW — a truly portable depth sounder — Raytheon Model DE-119A — SUITCASE SIZE

In your water depth surveys of harbors, lakes, inland waterways and reservoirs, your need for a low cost, precision depth sounder is fully answered by the Raytheon DE-119A.

Performance-proved in over 150 varied applications, this rugged, compact, light-weight unit accurately records depths in four ranges to 240 feet. Completely self-contained, the DE-119A is operated with an outboard-mounted portable transducer or one permanently installed in the hull of the boat. Power is supplied by a convenient 6-volt storage battery.

Detailed information is available from your nearest Raytheon office or write Dept. 6120.

CONDENSED SPECIFICATIONS

Dimensions: 16" x 18" x 8". Total weight: 46 lbs.

Ranges: 0-60, 60-120, 120-180, 180-240 feet.

Accuracy: ± 3" to 15 feet, ± 2% over 15 feet.

Chart Speed: 12", 30", 60" per hour — Model DE-119A.

(Also available, Model DE-119B with chart speeds of 36", 90", 180" per hour.)

Excellence in Electronics

RAYTHEON

RAYTHEON MANUFACTURING COMPANY

Commercial Equipment Division, Marine Products Dept., Waltham 54, Mass.

DISTRICT OFFICES: Atlanta, Baltimore, Boston, Chicago, Los Angeles, New Orleans, New York

THE MAP THAT GOT OUT OF LINE

The PHOTO CONTOUR MAP* is an entirely new *kind* of map.
A true map in every respect, it has these unique advantages over line-drawn maps and mosaics:

1) Self-checking through visual inspection;
2) Reduced field checking time; all the information of the aerial photograph is brought to your desk;
3) Drafting time reduced up to 50%;
4) Photo reproduction to the scale you require from one negative;
5) One base map will satisfy engineering requirements for planning and design;
6) Accurate to National Mapping Standards.

We shall be glad to discuss the process and its applications to specific mapping problems.

WHAT OF TOMORROW'S MAPS?

Research which perfected the *Photo Contour Map* continues in the Towill organization . . . tomorrow's maps may be in full color, dimensional . . . and at lower unit cost.

** Patented in 1957 by R. O. Mahan and R. M. Towill.*

R. M. TOWILL CORPORATION

233 Merchant St., Honolulu, Hawaii • 612 Howard St., San Francisco, Calif.

PRE-CONVENTION JOURNAL

The next Annual Meeting of the American Congress on Surveying and Mapping will be held in March, 1959.

Advertising Tie-in Opportunity

The October–December issue of the JOURNAL will tie-in with the forthcoming Convention. Prepare to advertise your exhibit and products in this important issue to stimulate the interest of those potential buyers attending this annual event. From an advertising standpoint, the issue will be of added value because of the consecutive Annual Meetings of the American Congress on Surveying and Mapping and the American Society of Photogrammetry, March 8–14, 1959.

Deadline: October 15, 1958

To advertise in the ACSM JOURNAL contact:

sba *SCHALER BUTLER ASSOCIATES*

1028 CONNECTICUT AVE., N.W., WASHINGTON 6, D. C.

Dedicated to the needs of the Surveyor and Field Engineer

the most experienced and largest
INSTRUMENT SERVICE
staff in the west

SERVCO AND CONFIDENCE GO TOGETHER

Surveyors Service is the West's largest sales and repair service for transits, optical-reading theodolites, levels, alidades and similar equipment. Examination and condition report of your most delicate instruments made by skilled technicians without service charge. We invite you to bring your instruments to us.

SERVCO
Reg. T.M.

SURVEYORS SERVICE CO.
George A. Greenewald

2021 South Grand Avenue
Los Angeles 7, California
Richmond 7-0606

All Kinds of
Field Equipment
and SUPPLIES

Exclusive Distributors
Seiler Instrument Company
WILD CALIFORNIA ARIZONA NEVADA
Agents for
C. L. Berger & Sons, Inc.

Comparison and Compilation of State Registration Requirements Concerned with the "Profession of Land Surveying"

(Revised to March 1, 1958)

Compiled by VICTOR H. GHENT

SECRETARY, PROPERTY SURVEYS DIVISION
AMERICAN CONGRESS ON SURVING AND MAPPING

EDITOR'S NOTE.—This compilation, having been brought up to the date of August 7, 1957, by Mr. Ghent, was edited and prepared for publication as a 16-page lithographed pamphlet by C. S. Maltby, member of the Publications Committee of the American Congress on Surveying and Mapping, and was so published in December 1957. The lithographed version of this material was widely distributed to State Registration Boards and others interested in these matters, with the request that material for further revision be submitted as promptly as possible. The material received prior to March 1, 1958, has been combined with the original material and is published in complete form in the following pages.

"Where the State confers a license upon an individual to practice a profession, trade, or occupation, such license becomes a valuable personal right which cannot be denied or abridged in any manner except after due notice and a fair and impartial hearing before an unbiased tribunal."

EXPLANATION OF COLUMNS IN THE FOLLOWING TABLE

Warning Note: Statements contained herein are as comprehended by the compiler from study of each indivdual State Registration Act and have been verified by each State Board through March 1, 1958.

Statements are not to be construed as being the exact meaning of any such Acts nor is anything contained herein to be construed as being the opinion of A.C.S.M. or its PROPERTY SURVEYS DIVISION. The compilation is intended to be as factual as possible.

Professionals practicing in different States should obtain copies of each State Act, i.e., such acts as concern registration and professional practice.

1.—STATE OR TERRITORY OF THE UNITED STATES OF AMERICA

State names not shown in all-capital letters indicate those States that do not specifically license in fields of surveying and mapping.

2.—TITLE OF LICENSING AGENCY

Generally, "State Board of Registration for ————" or "State Board for ———— Examiners"

3.—COMPOSITION OF BOARDS

Number of members of Board and license required of same (generally 10–12 years experience also required).

4.—SURVEYING DEFINITIONS IN ACTS

"Minimum" equals "practice of land surveying means surveying areas for their correct determination and description, and for conveyancing, or for the establishment or re-establishment of land boundaries and plotting of lands and subdivisions thereof." Generally, where land surveying is defined, the words noted above are used, in one form or another, as a minimum basic. No attempt is made to include in this compilation comparable engineering definitions used in Acts. Professional Engineering is defined

© 1958, American Congress on Surveying and Mapping

in State Acts in a widely varying language, ranging from no actual definition to all-inclusive ones. For *each exact* Land Surveying definition see pages 304 to 310, inc.

5.—Qualifications of Applicants—Surveyors

Generally these are (1) college graduate with 2 years experience or (2) 6 years experience, plus examination, or (3) 10 years experience.

6.—Qualifications of applicants—Engineers

Generally these are (1) college graduate with 4 years experience or (2) 8 years experience, plus examination, or (3) 12 years experience.

Most acts provide for oral examinations in all three classes listed, and it is hard to tell from some Acts whether oral or written examinations are required. In some cases it is hard to tell whether oral or written examinations are optional. Also, it must be noted that under (2) and (3), college credits, year for year, up to 3, 4, or 5, generally are recognized toward experience requirements. No attempt has been made to show this latter breakdown in the following tabulation.

7.—Scope of Examination—Land Surveyors

This item is hard to find in most Acts for Land Surveyors; it being left to the discretion of the Board. In fact, it may be that some Acts so completely overlooked this item that no scope of examination can be gleaned. Minimums gathered from sample examinations available show that basic mathematics, trigonometry, algebra, geometry, areas, coordinates, deed interpretation, lot layout, and curves are given in just about all cases. Other items, as they are available at present, are listed.

8.—Application References Required

In many cases these are prescribed by law and apply equally to surveyors and engineers. However, they are listed herewith as they apply to surveyors. Where not prescribed by law, the references noted are as prescribed by application.

9.—Ethics

Ethics as covered either in the law or as set up by the Board. State Laws, in addition to ethics, call for revocation of license if same was obtained by fraud or if the practitioner has been found guilty of gross negligence, incompetency, or misconduct in the practice of the profession.

10.—Number of Engineering Branches

Many Engineering Acts attempt to separate engineering into its multiple fields. With the possible exceptions that exist where there are separate Acts for licensing civil engineers and structural engineers, the general Professional Engineers Acts do not attempt to specify what the practice of each separate branch includes, some acts just being content to list or enumerate them. Some Boards have gone far beyond the intent of the Acts by listing such branches. Most notable in this respect is the District of Columbia's recently enacted, and presumably a model law, which apparently ran into trouble when licensing under the "grandfather" clause and now lists 119 separate Professional Engineer licenses. It is to be presumed that these difficulties will clear with time, as appears to be the case in several other States where a high degree of separation has been attempted. However, licensing "by branch" becomes important in analyzing present surveyor licensing because many States recognize land Surveying as "a branch of engineering." Many States license engineers in recognized fields of surveying and mapping, and many States allow Professional Engineers (or Civil Engineers) to practice Land Surveying.

11.—Reciprocity—Land Surveyors

With other States, as authorized in the Acts as being possible, generally with certain restrictions or reservations.

12.—Exemptions or Exceptions

No attempt has been made in this list to show the various State exemptions or exceptions in the requirements for registration to practice Engineering or Land Surveying. In some cases they are so numerous as to almost lack interpretation. Generally,

standard exceptions are (1) Non-resident who is licensed (generally allowed to practice 30 days in one year—but check each State for permit requirements). (2) Recent arrival in State (generally if licensed in another State and application filed). (3) Employees of registrants, if not in responsible charge and while acting as employees. (4) Officers and employees of United States Government (while acting as employees thereof). (5) Practice of other recognized professions. (6) Elective officers and employees of State or politcal subdivisions thereof (while acting as employees). Other exemptions include such items as Utility or Interstate Corporation employees, individuals or corporations working on their own properties, employees of manufacturing companies, etc. This tabulation is only concerned with the interrelation of architecture, engineering, and land surveying, when such items are mentioned in the Acts.

13.—SEAL REQUIRED

All States issue certificates to practice and all provide for the renewal thereof, but all States do not provide for a seal of the engineers and surveyors. The list herewith shows the title applied, on the seal, to an engineer or land surveyor.

* * *

Harvard College Observatory Announcement Card 1408

Oblateness of the Earth by Artificial Satellites

The Commanding Officer of the U. S. Army Map Service and Dr. John A. O'Keefe report the following results from artificial satellites: "A preliminary determination of the oblateness of the earth has been made at the Army Map Service. It has not been possible to process the observational material; so far it has only been possible to analyze the elements published by NRL. A preliminary study of H. G. Hertz and M. Marchant, based on the NRL orbits of 1958 β_2 for 26 March to 6 June 1958, indicate that the oblateness is near the value of $1/298.38 \pm 0.07$. This value is considerably smaller than the international value of 1/297.0. In view of the general interest in this constant, it has been decided to put out this value in spite of its very preliminary nature. The determinations of 1/f with estimated standard deviations, when available are:"

Inverse Oblateness

Method used:	Node	Perigee
Satellite		
1958 α	298.0 ± 0.3	297.8
1958 β_2	298.38 ± 0.07	298.3

FRED L. WHIPPLE

June 24, 1958

Coast and Geodetic Survey Technical Bulletins Replace its Journal

In January 1958 Coast and Geodetic Survey Technical Bulletin 1 was issued, *Aerotriangulation Adjustment of Instrument Data by Computational Methods* by W. D. Harris. In March and May 1958 Technical Bulletins 2 and 3 were released, *Tellurometer Traverse Surveys* by Lt. H. P. Demuth and *Recent Increases in Coastal Water Temperatures and Sea Level* by Dr. H. B. Stewart, respectively. These bulletins are the first of a series and are available at nominal cost from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Succeeding bulletins will be released at regular intervals dealing with technical subjects in the various fields of Coast and Geodetic Survey operation and presenting the results of Bureau research and development. The series is designed for rapid publication and release of new developments as they occur. It supercedes the Coast and Geodetic Survey *Journal* which was discontinued with the seventh edition published in October 1957. The bulletins will cover the same subject matter as the *Journal* but their timely issuance will likely make them more useful to readers of SURVEYING AND MAPPING.

State or Territory	Title of Licensing Agency	Composition of Boards	Surveying Definitions in Acts	Qualifications of Applicants—Surveyors	Qualifications of Applicants—Engineers
ALABAMA	Professional Engineers and Land Surveyors	5 Professional Engineers	Minimum, plus mine workings	College graduate plus 2 years experience, or 6 years experience plus examination; or 10 years experience	College graduate plus 4 years experience, or 8 years experience plus examination
ALASKA	Engineers and Architects	6 Professional Engineers and 3 Architects	Licensed as Engineering Specialists		College graduate with 4 years experience, or 8 years experience, plus examination
ARIZONA	Architects, Engineers, Land Surveyors, and Assayers	5 Professional Engineers and 3 Architects	Minimum (Professional Engineering includes Geologists)	4 years experience plus examination	8 years experience plus examination
Arkansas	Professional Engineers	5 Professional Engineers	"Acts of Land Surveyors" exempt from license requirements		College graduate plus 4 years experience or 8 years experience, plus examination
CALIFORNIA	Civil and Professional Engineers	7 Professional Engineers	Minimum, plus Geodetic. Application blanks list qualified branches of surveying, such as Topographic, Municipal, and others.	5 years experience (3 years college is the maximum that may be included) plus examination	6 years experience. (4 years college is the maximum that may be included) plus examination
COLORADO	Professional Engineers and Land Surveyors	5 Professional Engineers	Minimum	College graduate plus 2 years experience, or 6 years experience plus examination, or 10 years experience	8 years experience plus examination, or 12 years experience
CONNECTICUT	Professional Engineers and Land Surveyors	5 Professional Engineers	"That branch of Engineering." Minimum, plus contours and mining surveys	College graduate plus 2 years experience, or 8 years experience, plus examination, or 12 years experience	College graduate plus 4 years experience, or 10 years experience, plus examination, or 15 years experience and over 40 years old
DELAWARE	Professional Engineers and Land Surveyors	4 Professional Engineers, 3 Land Surveyors	Minimum, plus grades for buildings, ditches, roads, sewers, etc., or the same as now being done by surveyors	4 years college plus 2 years experience, or 6 years experience plus examination, or 10 years experience	4 years college plu 4 years experience, or 8 years experience plus examination, or 12 years experience
DISTRICT of COLUMBIA	Professional Engineers	5 Professional Engineers	Professional Engineering Branches—Cadastral, Geodetic, Photogrammetric, Cartographic, Topographic, etc.		4 years college plus 4 years experience or 12 years experience plus examination (optional)
FLORIDA	Engineer Examiners	5 Professional Engineers (2 must be Land Surveyors)	Minimum (subdivides in accordance with regulations of the General Land Office and State laws). (Photogrammetry licensed under Professional Engineer)	College graduate or 3 years experience, plus examination	College graduate with 4 years experience or 10 years experience, plus examination
GEORGIA	Professional Engineers and Land Surveyors	4 Professional Engineers, 1 Land Surveyor	Minimum (application shows Branch of Engineering)	College graduate plus 2 years experience, or 6 years experience plus examination, or 10 years experience	College graduate plus 4 years experience or 8 years experience, plus examination, or 12 years experience
HAWAII	Professional Engineers, Architects, and Land Surveyors	5 Engineers, 3 Architects, and 3 Land Surveyors	Minimum	College graduate with 3 years experience or 12 years experience, plus examination	College graduate with 3 years experience or 12 years experience, plus examination

Scope of Examination—Land Surveyors	Application References Required	Ethics	Number of Engineering Branches	Reciprocity—Land Surveyors	Exemptions or Exceptions	Seal Required
Minimum, plus elevations, profiles	5, including 3 Engineers	Yes	31	No		(Optional) Professional Engineer Land Surveyor
	Application shows 5 references required		6	Yes (Engineers)		Registered Professional Engineer
	Application shows 5 references required		23 (now 7)	Yes (implied)	Architects may practice incidental Engineering, and Engineers may practice incidental Architecture, Assaying and Land Surveying	Engineer (Branch) Registered Land Surveyor
			13	Yes		Professional Engineer
	5 Civil Engineers or Land Surveyors		6	Yes	Civil Engineers may practice Land Surveying	Civil Engineer, Professional Engineer (Branch), Licensed Land Surveyor
	5 (application notes that 3 must be Professional Engineers)		Professional Engineering only	None	Engineers may practice Land Surveying	Registered Professional Engineer Registered Land Surveyor (or combination)
	5	Yes	40	Yes		Professional Engineer Land Surveyor
	5, including 3 Engineers or Land Surveyors	Yes (on application)	Professional Engineering only	Yes		Registered Professional Engineer Registered Land Surveyor
	5, including 3 Professional Engineers		119	Yes (Engineers)	Architects may practice incidental Engineering, and Engineers may practice incidental Architecture	Registered Professional Engineer
Minimum, including law, triangulation, polaris observations, and riparian rights	3 Professional Engineers or Land Surveyors		Professional Engineering only	Yes	Professional Engineers may practice incidental Land Surveying (except plats of record or court testimony)	Registered Engineer Registered Land Surveyor
	5, including 3 Professional Engineers or Registered Land Surveyors	Yes	23	Yes	Architects may practice incidental Engineering and Engineers may practice incidental Architecture	Registered Professional Engineer Registered Land Surveyor
Minimum, includes Topography, Triangulation, Cadastral, Laws, and Polaris observations			7	Yes (Engineers)	Map or survey must be stamped by Registered Land Surveyor	Registered Professional Engineer Registered Land Surveyor

State or Territory	Title of Licensing Agency	Composition of Boards	Surveying Definitions in Acts	Qualifications of Applicants—Surveyors	Qualifications of Applicants—Engineers
IDAHO	Engineering Examiners	5 Professional Engineers	Minimum, including a qualification that Land Surveyor means Engineer who practices Land Surveying but no other line of Engineering	College graduate with 2 years experience or 6 years experience, plus examination	College graduate with 4 years experience or 8 years experience, plus examination
ILLINOIS	Department of Registration and Education	3 Land Surveyors	Minimum	5 years experience plus examination	8 years experience plus examination
INDIANA	Professional Engineers and Land Surveyors	5 Professional Engineers, of whom 2 shall be Land Surveyors	Minimum (see Professional Engineering exception)	College graduate with 2 years experience or 4 years experience, plus examination	College graduate with 4 years experience or 8 years experience, plus examination
IOWA	Engineering Examiners	5 Professional Engineers	Minimum, Mine Surveyors also are licensed separately	College graduate with 2 years experience, or 6 years experience plus examination (1-1-59 to be 4 and 8)	College graduate with 2 years experience, or 6 years experience, plus examination (1-1-59 to be 4 and 8)
Kansas	Engineering Examiners	6 Professional Engineers			College graduate with 4 years experience, or 8 years experience plus examination, or 12 years experience
KENTUCKY	Professional Engineers	5 Professional Engineers	Professional Engineering Branches, include Cartographic and Planning and Zoning (no longer allowed) Geological, Landscape ("Engineering does not include work embraced within the practice of Land Surveying")		College graduate with 4 years experience, or 8 years experience, plus examination
LOUISIANA	Professional Engineers and Land Surveyors	7 Professional Engineers who are recommended by Engineering Societies	Minimum, includes topography and incidentals	College graduate or 6 years experience, plus examination	College graduate or 8 years experience, plus examination, or 20 years experience
Maine	Professional Engineers	5 Professional Engineers			College graduate with 4 years experience, or 8 years experience, plus examination, or 15 years experience
MARYLAND	Professional Engineers and Land Surveyors	4 Professional Engineers and 1 Land Surveyor	Minimum, including topography, grades, drainage and small drainage structures	College graduate with 2 years experience, or 6 years experience plus examination, or 10 years experience	College graduate with 4 years experience (examination optional), or 8 years experience plus examination, or 12 years experience
MASSACHUSETTS	Professional Engineers and Land Surveyors	6 Professional Engineers, 1 shall also be a Land Surveyor	Surveying of land for any purposes	College graduate with 2 years experience, or 6 years experience plus examination, or 10 years experience	College graduate with 4 years experience or 8 years experience, plus examination, or 12 years experience
MICHIGAN	Architects, Professional Engineers, and Land Surveyors	4 Professional Engineers, 3 Architects	Minimum	College graduate plus 4 years experience or 8 years experience, plus examination	College graduate plus 4 years experience or 8 years experience, plus examination

Scope of Examination—Land Surveyors	Application References Required	Ethics	Number of Engineering Branches	Reciprocity—Land Surveyors	Exemptions or Exceptions	Seal Required
Minimum, includes theory and practical surveying	5, including 3 Professional Engineers or Land Surveyors		6	Yes	Professional Engineers may practice Land Surveying	Registered Professional Engineer Registered Land Surveyor
Minimum, including U. S. and State Survey Laws, and subdivision of land	Application requires 2 references		Professional Engineering only	Yes	Land Surveying Act lists no exemptions. Professional Engineering Act lists 15 exemptions	Registered Professional Engineer Registered Land Surveyor
Minimum, including "ability to design and supervise engineering works"	5, including 3 Professional Engineers	Yes (on application)	8	Yes	Professional Engineers may practice Land Surveying. Plats and mine working maps must be signed by Professional Engineers or Land Surveyors	Registered Professional Engineer Registered Land Surveyor
Minimum		Yes	20	Yes (Engineers)	Landscaping and Geology may be considered surveying under Civil Engineering practice. Professional Engineers cannot practice Land Surveying	Yes
	5, including 3 Professional Engineers	Yes	17	Yes (Engineers)	Practice of any recognized profession is not restricted	Licensed Professional Engineer
			49 (now limited to 19)	Yes (Engineers)	Architects may practice incidental Engineering	Registered Professional Engineer
	Application requires 5 Professional Engineers	Yes, Engineering only	8, including Civil Engineers publicly employed	Yes (Engineers)	Civil Engineers may practice Land Surveying	Engineer (Branch) Registered Land Surveyor
	5, including 3 Professional Engineers		11	Yes (Engineers)		Registered Professional Engineer
	Application requires 5 Professional Engineers or Land Surveyors		8	Yes		Registered Professional Engineer Registered Land Surveyor (or combination)
	5, including 3 Professional Engineers		11	Yes	Permissive: Registration required only when using the word "Registered"	Registered Professional Engineer Registered Land Surveyor
Minimum, includes use and adjustment of instruments, law and practical surveying	5, including 3 Professional Engineers, Land Surveyors, or Architects		25 (now 8)	Yes	Only seal of Registered Land Surveyor may be used on surveys	Registered Professional Engineer Registered Land Surveyor

State or Territory	Title of Licensing Agency	Composition of Boards	Surveying Definitions in Acts	Qualifications of Applicants—Surveyors	Qualifications of Applicants—Engineers
MINNESOTA	Architects, Engineers, and Land Surveyors	5 Professional Engineers, 3 Architects, and 1 Land Surveyor	Minimum	Six years experience plus examination (minimum 4 years experience)	Eight years experience plus examination (minimum 3 years experience)
Mississippi	Professional Engineers	5 Professional Engineers	Practice of Land Surveying is exempt from Professional Engineer licensing		Eight years experience plus examination, or 12 years experience
MISSOURI	Architects and Professional Engineers	3 Architects and 3 Professional Engineers	Minimum, plus contours	College graduate (Civil) or 6 years experience plus examination	Eight years experience plus examination, or 20 years experience
MONTANA	Professional Engineers and Land Surveyors	5 Professional Engineers	Minimum (branch of engineering)	College graduate with 2 years experience, or 6 years experience plus examination, or 10 years experience	(By classes) College graduate with 4 years experience or 8 years experi-experience plus tion, or 12 years experience plus oral examination
NEBRASKA	Examiners for Land Surveyors	State Engineer, State Surveyor, Dean, University of Nebraska	Minimum	5 years experience (college degree equivalent to 2 years) plus examination	College graduate with 4 years experience or 8 years experience plus examination
NEVADA	Professional Engineers	5 Professional Engineers	Minimum, plus Land Surveying as a distinct branch of Professional Engineering; topographic, geodetic, municipal, establishing line or elevation in any work is embraced in Professional Engineering	No experience listed. Examination required	College graduate plus 4 years experience or 8 years experience, plus examination
New Hampshire	Professional Engineers	5 Professional Engineers			College graduate with 4 years experience, or 8 years experience plus examination, or 12 years experience
NEW JERSEY	Professional Engineers and Land Surveyors	5 Professional Engineers (1 is also a Land Surveyor)	Minimum, plus topography and land development	College graduate with 3 years experience or 6 years experience, plus examination, or 15 years experience	College graduate with 4 years experience or 8 years experience, plus examination, or 15 years experience
NEW MEXICO	Professional Engineers and Land Surveyors	3 Professional Engineers, 1 Land Surveyor, and 1 State Engineer	Minimum	College graduate with 2 years experience, or 6 years experience plus examination	College graduate with 4 years experience, or 8 years experience plus examination
NEW YORK	Professional Engineers and Land surveyors	3 or more Professional Engineers	Minimum (Surveying called Branch of Engineering on application)	6 years experience plus examination	College graduate with 4 years experience or 12 years experience, plus examination

Scope of Examination—Land Surveyors	Application References Required	Ethics	Number of Engineering Branches	Reciprocity—Land Surveyors	Exemptions or Exceptions	Seal Required
Minimum, including public-land surveying, U. S. Land Office, Topography, and subdivision of areas differing widely in character, value, and use	Required 6, including 4 Land Surveyors	Yes	39 (now limited to 11)	Yes		Registered Professional Engineer Registered Land Surveyor
	5, including 3 Professional Engineers		Professional Engineer only	Yes (Engineers)		Registered Professional Engineer
	5 (?)		Professional Engineer	Yes	Architects may practice incidental Engineering, Engineers may practice incidental Architecture. Any Registered Professional Engineer may be registered upon submission of satisfactory proof of qualifications required for Land Surveyors. All surveys must bear seal of a surveyor	Registered Professional Engineer Registered Land Surveyor
	5, including 3 Engineers		?	Yes	Architects may practice incidental Engineering.	Registered Professional Engineer Registered Land Surveyor
	5	Yes (on application)	Professional Engineers (only—?)	Yes	$5000 bond required. Survey plat and notes must be publicly filed	Registered Professional Engineer Registered Land Surveyor
Minimum, plus geodetic, triangulation, subdivision of lands, laws, public lands, polaris observations	3 Professional Engineers		18 (Cadastral, Cartography, Planning)	Yes	State water right surveyors, Registered Professional Mining Engineer for mining, etc.	Registered Professional Engineer (Branch) Registered Land Surveyor
			13	Yes (Engineers)	Architects may practice incidental Engineering; practice of any other recognized profession is not affected	Registered Professional Engineer
Minimum, plus elevations, polaris observations, subdivisions, and lot layout	5, including 3 Professional Engineers or 3 Land Surveyors	Yes (on application)	18 (now only Professional Engineer)	Yes (Engineers)	State and Political Subdivisions must employ licensed persons. Architects may take the last part of the Engineer examination	Licensed Professional Engineer Licensed Land Surveyor
	5, including 3 Professional Engineers (5 Professional Engineers, on application)		19	Yes		Registered Professional Engineer Registered Land Surveyor
Minimum, includes advanced algebra, solid geometry, spherical trigonometry, precision surveying, city and highway surveys, geodesy, hydrology, subdivision layout, law, and triangulation	5, including 3 Professional Engineers or 3 Land Surveyors		Professional Engineer only	Yes	Professional Engineers may practice incidental Land Surveying. Architects are exempt from the provisions of the Act, except in use of terms	Licensed Professional Engineer Licensed Land Surveyor

State or Territory	Title of Licensing Agency	Composition of Boards	Surveying Definitions in Acts	Qualifications of Applicants—Surveyors	Qualifications of Applicants—Engineers
NORTH CAROLINA	Professional Engineers and Land surveyors	4 Registered Engineers and 1 Registered Land Surveyor	Minimum includes elevations	College graduate with 1 year experience or 5 years experience, plus examination	College graduate with 4 years experience or 10 years experience, plus examination
NORTH DAKOTA	Professional Engineers	3 Professional Engineers	Minimum plus topography, laying out and subdivision of land ("Does not include street grade, curbing, or paving plans")	College graduate with 2 years experience or 6 years experience, plus examination or 10 years experience	College graduate with 4 years experience or 8 years experience, plus examination, or 12 years experience
OHIO	Professional Engineers and Surveyors	4 Professional Engineers and 1 Surveyor	Minimum (Surveying called branch of Engineering) including applied mathematics and mine surveying	College graduate with 4 years experience or 8 years experience, plus examination, or 25 years experience	College graduate with 4 years experience or 8 years experience, plus examination, or 25 years experience
Oklahoma	Professional Engineers	5 Registered Professional Engineers			College graduate with 3 years experience, or 8 years experience plus examination (optional)
OREGON	Engineering Examiners	9 Professional Engineers	Minimum, plus layout and subdivision of land, and topography	College graduate with 2 years experience or 6 years experience, plus examination	College graduate with 2 years experience or 6 years experience, plus examination
PENNSYLVANIA	Professional Engineers	5 Professional Engineers (not specified in Act)	Minimum (Branch of Engineering) including surveying to establish lines, grades, or elevations for carrying out engineering works, determining quantities of materials, preparing plans and specifications for minor works, etc., and estimating mineral deposits, etc.	College graduate with 2 years experience, or 6 years experience plus examination	College graduate with 4 years experience or Engineer in Training with 4 years experience, or 12 years experience plus examination
PUERTO RICO	Examiners of Engineers, Architects, and Land Surveyors	4 Engineers and 1 Architect	Minimum, including application of special knowledge of physics, mathematics, and surveying in professional services in cartography, surveying in relation to projects or engineering or architectural works, including graphic representations or designs	Two years of college with 2 years experience, plus examination	Five years of college or 8 years perience plus examination
RHODE ISLAND	Professional Engineers and Land Surveyors	5 Professional Engineers	Minimum (application calls it a Branch of Engineering)	College graduate with 2 years experience, or 6 years experience plus examination, or 10 years experience	College graduate with 4 years experience, or 8 years experience plus examination, or 12 years experience
SOUTH CAROLINA	Engineering Examiners	5 Professional Engineers recommended by Engineering Societies	Minimum	College graduate with 2 years experience, or 6 years experience plus examination, or 10 years experience and over 30 years old	College graduate with 4 years experience (examination optional), or 8 years experience plus examination, or 12 years experience and over 35 years old
SOUTH DAKOTA	Engineering and Architectural Examiners	2 Architects and 3 Professional Engineers, one of whom shall also be a Land Surveyor	Minimum	7 years experience plus examination	Eight years experience plus examination

Scope of Examination—Land Surveyors	Application References Required	Ethics	Number of Engineering Branches	Reciprocity—Land Surveyors	Exemptions or Exceptions	Seal Required
Minimum plus earthwork, construction and piping surveys, drafting	5	Yes (on application)	Engineer only	Yes	Registered Engineers may practice Land Surveying; "permissive"—persons may do Land Surveying if they do not use the term "Registered"	Registered Engineer Registered Land Surveyor
	5, including 3 Professional Engineers or Land Surveyors		11	Yes		Registered Professional Engineer Registered Land Surveyor (or combination)
Minimum, includes applied mathematics, law, topography, subdivisions and mine surveying	5, including 3 Professional Engineers	Yes (on application)	21	Yes	Architects may practice incidental Engineering, and Engineers may practice incidental Architecture	Registered Professional Engineer Registered Land Surveyor
	Application shows 5, including 3 Professional Engineers		Professional Engineer, with 24 branches listed on application	No	Exemption for landscape and drainage engineering	Registered Professional Engineer
Minimum, inlcudes laws	Application shows 5, including 3 Prosional Engineers	Yes	14	Yes	Professional Engineer may practice Land Surveying	Registered Professional Engineer Registered Land Surveyor
Minimum, includes practical surveying problems	Application requires 5 Engineers	Yes	Professional Engineer only	Yes	Professional Engineers may practice incidental Architecture and surveying, and Architects may practice incidental Professional Engineering. Land Surveyors may not practice any other branch of Engineering	Engineer Registered Surveyor
	Application shows 1 Engineer, Land Surveyor, or Architect		Engineer only	Yes		Optional
	5, including 3 Professional Engineers	Yes	Professional Engineer only	Yes (Engineers)	Public Works, Architects may practice incidental Engineering and Professional Engineers may practice Land Surveying	Registered Professional Engineer Registered Land Surveyor
Minimum	5, including 3 Registered Land Surveyors			Yes	Persons in public works	Registered Professional Engineer Registered Land Surveyor
Minimum, includes "ability to design and supervise engineering or architectural works" or locate boundary lines to insure life and protection of property, and laws	Application shows 5, including 3 Professional Engineers, Land Surveyors, or Architects	Yes (on application)	12	No	No survey of land or plat subdivision shall be legal unless made by a Licensed Surveyor	Registered Professional Engineer Registered Land Surveyor

State or Territory	Title of Licensing Agency	Composition of Boards	Surveying Definitions in Acts	Qualifications of Applicants—Surveyors	Qualifications of Applicants—Engineers
Tennessee	Examiners for Architects and Engineers	3 Engineers and 3 Architects			Eight years experience plus examination
TEXAS	Public Surveyors	6 Surveyors in public practice	Minimum, including "such other duties as sound surveying practice would direct"	6 years experience plus examination	College graduate with 4 years experience, or 8 years experience plus examination
UTAH	Committee of Engineering Examiners	7 Professional Engineers, 1 of whom is also a Land Surveyor	Minimum (application calls it a Branch of Engineering)	2 years of college with 2 years experience or 6 years experience, plus examination	College graduate with 4 years experience, or 8 years experience, plus examination, or 12 years experience and over 35 years old
Vermont	Professional Engineers	3 Professional Engineers (recommended by Engineering Societies)	"The Act shall not affect a qualified or practical surveyor"		College graduate with 3 years experience, or 8 years experience plus examination
VIRGINIA	Examination and certification of Architects, Professional Engineers, and Land Surveyors	3 Architects, 3 Professional Engineers, and 3 Land Surveyors	Minimum, includes topography, drainage, storm sewers, roads, sanitary sewer extensions (where prescribed standards exist)	Experience as determined by Board, plus examination. (Presently college graduate plus 2 years experience or 8 years experience plus examination)	Experience as determined by Board, plus examination. (Presently college graduate with 4 years experience or 10 years experience, plus examination, or 16 years experience.)
WASHINGTON	Department of Licenses	5 Registered Professional Engineers	Minimum, includes layout and subdivision of land, and topography	College graduate plus 2 years experience or 6 years experience, plus examination	College graduate plus 2 years experience or 8 years experience, plus examination
West Virginia	Professional Engineers	5 Professional Engineers			College graduate with 4 years experience or 8 years experience, plus examination. (Examination optional)
WISCONSIN	Architects and Professional Engineers	1 State Architect, 1 State Engineer, 1 College Dean, 3 Architects, and 3 Professional Engineers (1 also a Land Surveyor	Minimum	2 years of college with 2 years experience or 6 years experience, plus examination, or 20 years experience. Provision for Apprentices plus examination	College graduate with 4 years experience or 8 years experience, plus examination, or 12 years experience
WYOMING	Examining Engineers	1 State Engineer and 4 Professional Engineers, 2 of whom must also be Land Surveyors	Minimum plus other work involving plane surveying and mapping	College graduate plus 2 years experience or 6 years experience, examination optional	College graduate plus 4 years experience plus examination optional or 8 years years experience plus examination

Scope of Examination—Land Surveyors	Application References Required	Ethics	Number of Egni-neering Branches	Reciproc-tiy—Land Surveyors	Exemptions or Exceptions	Seal Required
			Engineers only	Yes (Engi-neers)	Practice of Survey-ing by individuals, etc., not involving public health or safety and not using the title "Engineer"	Registered Engineer
Minimum, includes special reference to applicants' ability to safeguard public wel-fare and property rights	5, including 3 Surveyors	Yes, Engineer	14	Yes (Engi neers)	County and Licensed State Land Surveyors and Professional En-gineers when prac-ticing their profes-sion as authorized by law	Registered Public Surveyor
Minimum, includes all phases of surveying	5, including 3 Engineers (application shows 8, in-cluding 5 En-gineers or Land Surveyors)		20	Yes (Engi-neers)		Registered Profes-sional Engineer Registered Land Surveyor
	5, including 3 Engineers	Yes (on applica-tion)	11	Yes (Engi-neers)	Architects or persons experienced in con-struction of buildings to such practice of Engineering as is incidental to their professions	Registered Profes-sional Engineer
Minimum plus ?	Application shows 5 re-quired, En-gineers pre-ferred but 3 Land Surveyors required plus employers	Yes (on applica-tion)	19 (now 16)	Yes (Engi-neers)	Architects may prac-tice incidental En-gineering or Land Surveying, and En-gineers may practice incidental Architec-ture or Land Sur-veying	Optional, Engineer-ing Branch Certi-fied Land Surveyor
Minimum, includes applicants' "Ability to design and supervise engineering works to insure safety of public health, life, and prop-erty," and topography and geodesy	5, including 2 Professional Engineers		27 including Marine Surveys	Yes	A Registered Profes-sional Engineer may not practice Land Surveying unless he is so licensed	Registered Profes-sional Engineer Registered Land Surveyor
	5, including 3 Professional Engineers		14	Yes (Engi-neers)		Registered Profes-sional Engineer
	Presumably 5, including 3 Professional Engineers	Yes	Professional Engineer only	Yes	A license is not re-quired of an owner to survey for pur-poses other than sale of property	Professional Engineer Land Surveyor
	5, including 3 Land Surveyors		Professional Engineer only	Yes	A public employee must be licensed; Act "cannot be con-strued as authoriz-ing Professional En-gineers to make land surveys"	Registered Profes-sional Engineer Registered Land Surveyor

State Laws Defining Land Surveying

Compiled by VICTOR H. GHENT

SECRETARY, PROPERTY SURVEYS DIVISION, ACSM

EDITOR'S NOTE.—The following material constitutes a revision and extension of the material published as "State Laws Defining Land Surveying" (*See* SURVEYING AND MAPPING, Vol. XVI, No. 1, pages 14–19, inc.) and as "Additional State Laws Defining Land Surveying" (*See* SURVEYING AND MAPPING, Vol. XVI. No. 3, page 299.) Material in both papers referred to above was compiled by Victor H. Ghent, Secretary, Property Surveys Division, ACSM.

ALABAMA

"The term 'land surveyor' as used in this Chapter shall mean a person who engages in the practice of land surveying as hereinafter defined. The practice of land surveying within the meaning and intent of this Chapter includes surveying of areas and underground mine workings for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof."[1]

ARIZONA

" 'Land Surveyor' shall mean a person who engages in the practice of surveying tracts of land for the determination of their correct location, areas, boundaries, and description, for conveyancing and recording, or for establishment or re-establishment of boundaries and the plotting of lands and subdivisions."

CALIFORNIA

"A person practices land surveying within the meaning of this chapter who, either in a public or private capacity, does or offers to do any one or more of the following:

(a) Locates, relocates, establishes, re-establishes, or retraces any property line or boundary of any parcel of land or any road, right of way, easement, alignment or elevation for any of the fixed works embraced within the practice of civil engineering, as described in Chapter 7, Division 3 of this code.

(b) Makes any survey for the subdivision or resubdivision of any tract of land.

(c) By the use of the principles of land surveying determines the position for any monument or reference point which marks a property line, boundary or corner, or sets, resets or replaces any such monument or reference point.

(d) Determines the configuration or contour of the earth's surface or the position of fixed objects thereon or related thereto, by means of measuring lines and angles, and applying the principles of trigonometry.

(e) Geodetic or cadastral surveying.

(f) Determines the information shown or to be shown on any map or document prepared or furnished in connection with any one or more of the functions described in subsections (a), (b), (c), (d), and (e).

(g) Indicates, in any capacity or in any manner, by the use of the title 'Land Surveyor' or by any other title or by any other representation that he practices or offers to practice land surveying in any of its branches.

(h) Procures or offers to procure land surveying work for himself or others.

(i) Manages, or conducts as manager, proprietor, or agent, any place of business from which land surveying work is solicited, performed or practiced." (Amended 1941)

COLORADO

"The practice of land surveying within the meaning and intent of this article includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment of land boundaries and the plotting of lands and subdivisions thereof."

CONNECTICUT

"The practice of Land Surveying means

[1] Applicants, on examination, must be familiar with elevations, profiles, and trigonometric leveling.

that branch of engineering and applied mathematics which includes the surveying and measuring the area of any portion of the earth's surface, the lengths and directions of the bounding lines, the contour of the surface, for their correct determination and description and for conveyancing or for recording, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof; and like measurements and operations involved in the surveying of mines."

DELAWARE

"The practice of land surveying within the meaning and intent of this Act includes all land surveying, surveying of areas for the correct determination and description, and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof; also, grades for buildings, ditches, roads, sewers, etc., or same as now being done by land surveyors."

FLORIDA

"A person practices 'Land Surveying' within the meaning of this Act, who re-establishes the original lines and corners of Townships, Ranges, Sections, and the subdivisions thereof, as established by the Surveyors deputized by the Surveyor General to survey the public lands of Florida; who subdivides the land in accordance with rules and regulations prescribed by the General Land Office and the laws of Florida; who surveys and otherwise determines on the ground the plane boundaries of tracts and parcels of land, traverses the boundaries of lakes, water courses, seacoast and similar natural features; who resurveys on the ground lines of any subdivisions surveyed at a previous date by himself or other surveyors and who otherwise performs recognized acts of land surveying in connection with the establishing and re-establishing of boundaries of tracts of land."

GEORGIA

The practice of land surveying within the meaning and intent of this Act includes surveying of areas of the earth surface for their correct determination and description and for conveyancing, and recording, or for the establishment or re-establishment of land boundaries and the plotting of land and subdivisions thereof."

HAWAII

"A person practices 'land surveying' who holds himself out as able to make, or who does make cadastral surveys of areas for their correct determination and description, either for conveyancing or for the establishment or re-establishment of land boundaries or the plotting of lands and subdivisions thereof."

IDAHO

"The term 'Land suvreyor' means an engineer who engages in the practice of land surveying, but does not practice any other line of engineering, and whose license is limited to land surveying. The term 'land surveying' includes responsible supervision of surveying of areas for their correct determination and descriptions and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof."

ILLINOIS

"Any one or any combination of the following practices constitutes the practice of land surveying:

(1) Surveying and measuring the area of any portion of the earth's surface, the lengths and directions of the boundary lines, and the contour of the surface for their correct determination and description, and for conveyancing or for recording or for establishing or re-establishing, locating, defining and marking or monumenting land boundaries or lines and the platting of land and subdivisions thereof; or

(2) Preparing and vouching for the accuracy of a map or plat showing such land boundaries or lines and the marks and monuments thereto, or map or plat of a subdivision or partition of land for the purpose of making the same an instrument of public record; or

(3) Executing and issuing plats establishing one or more corners or boundaries of

any tract or lot of land and signing therefor as a surveyor."

INDIANA

"The term 'Practice of Land Surveying', as used in this Act, includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment, or re-establishment of land boundaries, and the plotting of land and subdivisions thereof."

IOWA

"The practice of 'land surveying' within the meaning and intent of this chapter includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the platting of land boundaries and subdivisions thereof."[2]

LOUISIANA

"The term 'Land Surveyor' as used in this Act shall mean a person who engages in the 'Practice of Land Surveying' as hereinafter defined.

"The 'Practice of Land Surveying' within the meaning and intent of this Act includes measuring of areas, land surfaces, streams, bodies of water and swamps for their correct determination and description, for the establishment, re-establishment, ascertainment or description of land boundaries, corners, divisions, distances and directions, the plotting and monumenting of lands and subdivisions thereof, and mapping and topographical work."

MARYLAND

"The practice of land surveying within the meaning and intent of this Article includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof. The plotting of lands and subdivisions may include topography and contours, setting grades and determining drainage of streets and roads, and providing for small drainage structures."

MASSACHUSETTS

" 'Land Surveying', or 'practice of land surveying' shall include surveying of land for any purpose."

MICHIGAN

"The practice of land surveying within the meaning and intent of this Act includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof."

MINNESOTA

"Any person shall be deemed to be practicing land surveying within the meaning of Sections 326.02 to 326.16 who makes any survey for the establishment or re-establishment of land boundaries, or for the subdivision and platting of land or for the determination of areas."[3]

MISSOURI

" 'Land Surveying' means the surveying and measuring of the area of any portion of the earth's surface; locating and measuring the lengths and directions of the boundaries of land, and subdivisions thereof in this State, for compensation in any form or manner."

MONTANA

"The term 'Land Surveyor' when construed by the Board shall mean a person who engages in the practice of land surveying as hereinafter defined.

"The term 'Practice of Land Surveying' when construed by the Board shall mean the surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries, and the plotting of lands and subdivisions thereof."

NEBRASKA

"Land Surveying shall mean and include

[2] Act specifically excludes topography from land surveying.

[3] Applicants are examined on topographic surveying.

the surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land monuments and boundaries and the platting of lands and subdivisions thereof."

NEVADA

"A person practices land surveying within the meaning of this Act who, in a private or public capacity does or offers to do any one or more of the following:

(a) Locates, relocates, establishes, re-establishes, or retraces any property line or boundary of any tract of land or any road, right-of-way, easement, alignment, or elevation of any of the fixed works embraced within the practice of professional engineering as described in Section 2 of the engineer's registration law.

(b) Makes any survey for the subdivision or resubdivision of any tract of land.

(c) By the use of the principles of land surveying, determines the position of any monument or reference point which marks a property line, boundary or corner, or sets, resets, or replaces any such monument or reference point.

(d) Determines the configuration or contour of the earth's surface or the position of fixed objects thereon or related thereto, by means of measuring lines and angles, and applying the principles of trigonometry.

(e) Geodetic and cadastral surveying.

(f) Municipal and topographic surveying.

(g) Determines the information shown or to be shown on any map or document prepared or furnished in connection with any one or more of the functions described in subsections (a), (b), (c), (d), (e), and (f).

(h) Indicates in any capacity or in any manner, by the use of the title 'Land Surveyor,' or by any other title or by any other representation that he practices or offers to practice land surveying in any of its branches.

(i) Procures or offers to procure surveying work for others, or for himself.

(j) Manages or conducts as manager, proprietor, or agency, any place from which land surveying is solicited, performed, or practiced.

(3) Surveys made exclusively for geological or landscaping purposes, or aerial photograph or photogrammetry, and not involving any of the practices specified in subsection 2 of this section do not constitute land surveying within the meaning of this Act.

(4) Surveys authorized under this act do not include the design, either in whole or in part, of any structure or fixed works embraced in the practice of professional engineering, as defined in Section 2 of the engineers registration law."

NEW JERSEY

"The practice of land surveying within the meaning and intent of this Chapter includes surveying of areas for their correct determination and description and for conveyancing, and for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof, and such topographical survey and land development as is incidental to the land survey."

NEW MEXICO

"The practice of land surveying within the meaning and intent of this Act includes the application of a knowledge of mathematics and those principles of engineering required in surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof."

NEW YORK

"A person practices land surveying within the meaning and intent of this article who surveys areas for their correct determination and description, and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof."[4]

NORTH CAROLINA

"The term 'Practice of Land Surveying' within the meaning and intent of this Act includes surveying of areas for their correct determination and for conveyancing, or for the establishment or re-establishment of

[4] Applicants examined in hydrographic and geodetic surveying.

land boundaries or for the plotting of lands and subdivisions thereof, or the determination of elevations and the drawing descriptions of lands or lines so surveyed."[5]

NORTH DAKOTA

" 'Practice of Land Surveying' shall mean the assuming of responsible charge of the surveying of land for the establishment of corners, lines, boundaries, and monuments, the laying out and subdivision of land, the defining and locating of corners, lines, boundaries, and monuments after they have been established, the survey of land areas for the purpose of determining the topography thereof, the making of topographical delineations, and the preparing of maps and accurate records thereof, when the proper performance of such services requires technical knowledge and skill." (Does not include street grade, curbing or paving plans.)

OHIO

" 'Practice of Surveying' means that branch of engineering and applied mathematics which teaches the art of surveying and measuring the area of any portion of the earth's surface, the lengths and directions of the bounding lines, and the contour of the surface, for their correct determination and description and for conveyancing, for recording, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions; and like measurements and operations involved in the surveying of mines commonly known as 'Mine surveying'."[6]

OREGON

" 'Professional land surveying' means and includes assuming responsible charge of the surveying of land for the establishment of corners, lines, boundaries, and monuments, the laying out and subdivision of land, the defining and locating of corners, lines, boundaries and monuments of land after they have been established, the survey of land areas for the purpose of determining the topography thereof, the making of topographical delineations and the preparing of maps and accurate records and descriptions thereof."

PENNSYLVANIA

" 'Practice of Surveying' means the practice of that branch of the profession of engineering which makes surveys for the determination of area, and for the establishment or re-establishment of land boundaries and the subdivision and plotting of land, and who makes surveys for the establishment of lines, grades or elevations for carrying out engineering work, and who, in connection therewith, determines quantities of materials and prepares plans or specifications for minor work not involving safety to life or health, and who determines quantities or who make estimates for proposed work, or for work under construction, or work that is completed, or who, in addition to the foregoing, makes estimates of quantities of mineral or minerals in place, or that have been removed."

PUERTO RICO

"Licensed surveyor.—Means any person who by virtue of his special knowledge of physics and mathematics and of the principles and methods used in surveying, acquired through the learning disciplines and professional experience, is qualified to practice surveying, as defined in subdivision (f) of this section—and as it may be ascertained by the Board through a license issued in his name.

(f) Practice of Surveying—Means:

1. The rendering of any professional service or the doing of any work requiring the knowledge, training and experience of a surveyor as defined in subdivision (d) of this section.

2. The application of the said special knowledge of physics, mathematics and surveying when rendering such professional services required in the realization of any cartographic work, surveying in relation to projects or engineering or architectural works, determinations and descriptions of areas, demarcation and division of lands, and the verification and certification thereof, including graphic representations or designs.

[5] Permissive law.

[6] Applicants examined in route surveying, profiles.

It shall be understood that a person practices or offers himself to practice surveying if, through the use of written or oral words, labels, symbols, drawings or through any other kind of signs by any other physical means, announces himself as a surveyor."

RHODE ISLAND

"The practice of 'Land surveying' within the meaning and intent of this Act includes responsible supervision of surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof."

SOUTH CAROLINA

"The 'practice of land surveying' within the meaning and intent of this Chapter includes surveying of areas for their correct determination and description and for conveyancing or for the establishment or re-establishment of land boundaries and the platting of lands and subdivisions thereof."

SOUTH DAKOTA

"Any person who shall be engaged in locating, establishing, or relocating any land boundary line between two or more landowners, or who shall be engaged in locating any United States government, State, county, township, or municipal land survey lines of any public streets or roads, is hereby declared to be a 'surveyor' and as practicing land surveying within the provisions of this chapter."

TEXAS

"Public Surveying is the science or practice of land measurement according to established and recognized methods engaged in and practiced as a profession or service available to the public generally for compensation, and comprises the determination by means of survey, of the location or relocation of land boundaries and land-boundary corners; the calculation of area and the preparation of field-note description of surveyed land; the preparation of maps showing the boundaries and areas of the subdivision of tracts of land into smaller tracts; the preparation of official plats or maps of said land and subdivisions in compliance with the laws of the State of Texas and the political subdivisions thereof; and such other duties as sound surveying practice would direct."

UTAH

" 'Land surveying' includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the plotting of lands and subdivisions thereof."

VIRGINIA

(Effective 6-27-58)

" 'Land Surveying' includes surveying of areas for their correct determination and description, and for the conveyancing, or for the establishment and re-establishment of internal and external land boundaries, and the plotting of land and subdivisions thereof. The plotting of land and subdivisions thereof may include the laying out and plotting of roads, streets, and sidewalks, topography and contours setting forth road grades and determining drainage on the surface.

In addition to the work described above, a land surveyor may, for subdivisions only, prepare plats, plans and profiles for roads, storm drainage and sanitary sewer extensions where such work involves the use and application of standards prescribed by local or State authorities, provided the land surveyor passes an examination given by the Board in addition to that provided for the certification of land surveyor under paragraph (a) above; provided, however, that any land surveyor who shall, within one year from the effective date of this act, submit satisfactory proof to the Board that he has satisfactorily engaged in such work in the past, may continue to do such work without further examination.

Nothing contained in subsections (a) and (b) shall be construed to include engineering design and the preparation of plans and specifications for construction."

WASHINGTON

"The term 'practice of land surveying'

within the meaning and intent of this Act, shall mean assuming responsible charge of the surveying of land for the establishment of corners, lines, boundaries, and monuments, the laying out and subdivision of land, the defining and locating of corners, lines, boundaries and monuments of land after they have been established, the survey of land areas for the purpose of determining the topography thereof, the making of topographical delineations and the preparing of maps and accurate records thereof, when the proper performance of such services requires technical knowledge and skill."

WISCONSIN

"The practice of land surveying within the meaning and intent of this section includes surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and the platting of lands and subdivisions thereof."

WYOMING

" 'Land Surveying' is surveying having to do with the boundaries or areas of tracts of land for their correct determination and description, and for conveying, when that is involved, or for the establishment or re-establishment of land monuments and boundaries and the platting of lands and subdivisions thereof, and making plats, maps and drawings descriptive of the lands or lines so surveyed, platted or investigated, or for other work involving plane surveying and mapping."

RYKER M11-X STEREOSCOPE
with OFFSET BRACKET
PHOTOS WILL CENTER 15" AHEAD
OF BRACKET BASE.
THIS BRACKET ALSO CAN BE USED WITH
RYKER M11 and M12 STEREOSCOPES
HARRISON C. RYKER, INC., 1209-8th AVE., OAKLAND 6, CALIF. U.S.A.

Azimuth by Solar-Altitude Observation How Good Is It?

By RALPH MOORE BERRY

PROFESSOR OF GEODESY AND SURVEYING, UNIVERSITY OF MICHIGAN

EVER SINCE the American surveyor abandoned the magnetic compass as an instrument for the determination of meridian in property surveys and for various engineering surveys, he has been confronted with the problem of selecting a method of meridian determination which will give results consistent with the accuracy inherent in the engineer's transit.

For more than a century, the surveyor has been aware of the method of observing Polaris at elongation and the fact that consistent accuracy is inherent in the method. However, during a large part of the summer elongation occurs at late night or early morning when it is not convenient to make observations. A solution to this problem lies in the use of the method of observing Polaris at any hour angle with but slight increase in the labor of computation. This method, however, requires a reasonably accurate knowledge of the time of observation, and this was not easily available until the rather recent introduction of continuous radio time signals. Both the "elongation" and the "any hour angle" methods are subject to the objection that they ordinarily require that the observations be made at night, which introduces practical and economic objections that cannot be ignored.

Because of the foregoing objections, the surveyor has preferred to observe the sun for his determination of astronomic meridian (if, indeed, he made any such observations at all). Although two methods, the "hour angle" and the "altitude" method are available for use, the fact that the former requires an accurate time observation while the latter requires time to be known only with sufficient accuracy to interpolate in tables for the declination of the sun (approximately five minutes) has led to the almost universal adoption of the "altitude" method.

With the belief that the geometrical limitations on this method are but poorly understood, the writer has undertaken to investigate the conditions which must be met in order that a solar meridian determined by the altitude method may have the desired accuracy.

Basically, the altitude method consists of observing a vertical angle to the sun simultaneously with the observation of the horizontal angle between a fixed terrestrial line and the sun. By computation, knowing the latitude of the point of observation and the declination of the sun at the moment of observation, the bearing of the sun can be determined as a function of the observed vertical angle of the sun at the moment of observation.

The function to be used with the greatest facility is:

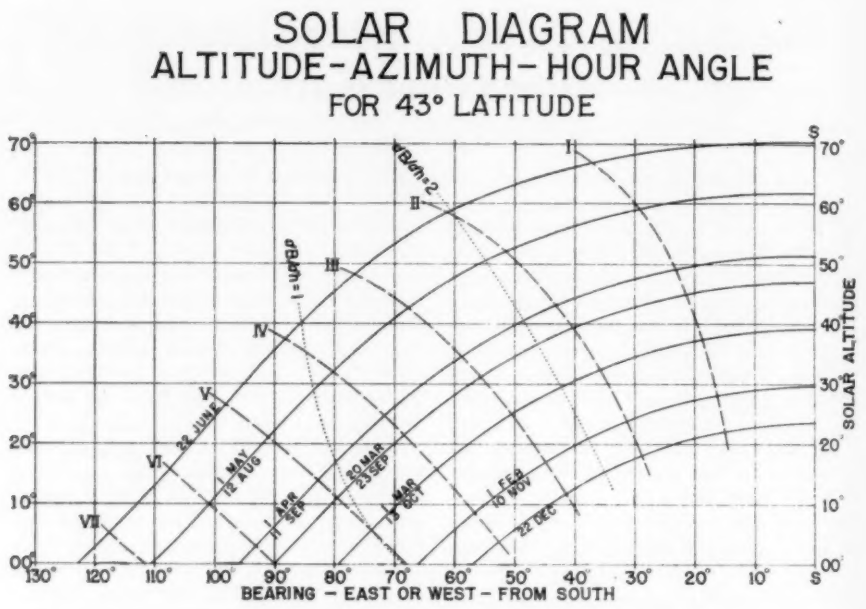
$$\text{Cos } B_s = \frac{\sin h \sin \phi - \sin \delta}{\cos h \cos \phi}$$

where

B_s = Bearing of sun east of *south* in morning, and vice versa,
h = Vertical angle of sun, above the horizontal,
ϕ = Latitude of point of observation, and
δ = Declination of the sun at the time of observation

This formula will, for the times at which observations are usually made, generally result in a positive value for cos B_s which enables the computer to evaluate B_s easily as an angle less than 90°.

The SOLAR DIAGRAM shows, for certain selected dates throughout the year, and for an observer at 43° north latitude, the path of the sun as a graph of bearing vs. altitude. Since these curves are very nearly symmetrical about the noon-line (or the



ROMAN NUMBERS INDICATE HOURS BEFORE OR AFTER UPPER MERIDIAN TRANSIT

dB/dh = RATE OF CHANGE OF BEARING WITH RESPECT TO CHANGE IN SOLAR ALTITUDE

southern extension of the celestial meridian), only the eastern half of the diagram has been plotted. It is obvious from inspection of these curves that as the sun approaches the upper meridian transit (local apparent noon or maximum solar altitude) the bearing changes rapidly while the altitude changes but very slowly. This, of course indicates that a meridian determined from a solar-altitude observation made near local apparent noon is subject to serious inaccuracy.

Surveyors have been vaguely aware of this and the textbooks warn of these circumstances. An empirical rule used by many observers states "avoid solar-altitude observations taken within two hours of local apparent noon." Obviously the limitation to be imposed involves the slope of the tangent to the bearing-altitude curve for the date of observation, i.e., the error in bearing caused by an error in the observed altitude is equal to the error in altitude multiplied by the rate of change in bearing with respect to the rate of change in altitude. In mathematical form this can be stated:

$$\Delta B = \Delta h \frac{dB}{dh}$$

The rate of change of bearing with respect to rate of change in altitude is obtained by differentiating the given equation used for the computation of B_s.

The results of this operation are plotted on the diagram. It seemed at first that a logical limitation would be to restrict solar-altitude observations to those times when the error in bearing caused by an error in altitude did not exceed the error in altitude; i.e., restrict observations to those portions of the curve where dB/dh is less than unity. For this purpose, the differential dB/dh was placed equal to unity and solved for the particular values of B_s and h that would satisfy this equation for each curve plotted. This is shown on the diagram by the dotted line labeled "$dB/dh = 1$."

Examination of this curve reveals that this would be an unrealistic limitation because, depending on the time of year, observations could not be made within approximately four to five hours of local apparent noon. Combined with the usual restriction of avoiding observations when the solar altitude is less than ten degrees (because of uncertainty in evaluation of refraction correction) it would not permit any observations at all from about the first of October to the first of March.

The entire operation was repeated with the less restrictive limitation that the error in bearing should not exceed double the error in altitude. This involved placing the differential of the equation for the bearing-altitude curve equal to 2 and solving for a point on each curve. This result is plotted on the diagram as the dotted curve "$dB/dh = 2$." Note that this curve very roughly coincides with the curve showing the position of the sun two hours before or after local apparent noon (upper meridian transit). It might, then, be inferred that the limitation of $dB/dh = 2$ may have been the real justification and source for the old rule to avoid solar observations within two hours of local noon.

In applying this criterion, the observer should be aware of the inaccuracy possible. With an ordinary engineer's transit, the reading of the vertical circle is dependent on a vernier plate which is rigidly attached to the transit standard. This means that it is dependent on the "plate" bubble for horizontal reference. It is probable therefore, that, with the usual 60″–90″ sensitivity bubble, the horizontal reference is in error by 30″ or more, even if the correct procedure for "leveling the plate" (making the axis of rotation vertical) has been followed. If the bubble is out of adjustment (the usual condition) and the observer does not follow the "centering position" procedure, errors of one or two minutes can be expected. Errors due to this cause are not compensated by "direct" and "reverse" observations. It follows, then, that, as the time of observation approaches the $dB/dh = 2$ limit, the inherent error in bearing due to inaccuracy of horizontal reference is probably at least one minute and may approach four minutes.

In the foregoing discussion, errors due to pointing on the sun (both vertical and horizontal), those due to inaccuracy of graduation or eccentricity of mounting of the vertical circle, and those due to inaccuracies in the evaluation of the refraction correction have been ignored. On the other hand, if the instrument has a separate control bubble on the index of the vertical circle, which makes the observed vertical angle independent of the vertical axis of the instrument, a substantial reduction in the error of the vertical angle due to horizontal reference error can be effected.

Note that the diagram is computed for latitude 43° north. Different limiting times would be obtained from studies of the bearing-altitude curves for significantly different latitudes.

GUARANTEED • RELIABLE
MATHEMATICAL SERVICES FOR SURVEYORS
Specializing in Subdivisions
Highways - Grades - Earthwork
Maurice Gould 147-15 69 Rd. Flushing 67, N. Y. Phone: BO 8-0728
WILL SERVICE ANY SECTION OF U.S.A.

PARK AERIAL SURVEYS, INC.
Est. 1920
AERIAL PHOTOGRAPHIC & TOPOGRAPHIC SURVEYS
STANDIFORD FIELD LOUISVILLE, KY.

Education for Surveyors

Abstract by Professor Leo V. Nothstine, Chairman, Education Division, ACSM, of a paper by Professor Sybren H. DeJong, University of British Columbia, entitled "Education for Surveyors" and presented at the Annual Meeting of the Canadian Institute of Surveying, January 1958.

THIS PAPER DEALS with the problems of Surveying Education at the professional level and the possible solutions thereof.

The trend in education is away from technical training and toward a broadly scientific, mathematical, and cultural base. References are cited. Canadian universities have a surge of young people seeking admission. From them must come the members for all professions. Surveying education must be provided.

Professional education has three aspects. One is the cultural phase which lasts four years. The second is the mathematical and scientific base which is essentially the first two years. The third is the emphasis on application problems involving the mathematics and science for the development of the student in his professional field. This is the area in which geodesy and allied subjects must be taught.

The advancement of structural theory as well as expansion of other civil engineering fields has caused a marked decrease in surveying instruction. This prevents the inclusion of new subject matter essential to adequate training for the surveying profession. It is time for a teaching department of surveying. Examples for the need outside Canada are cited. The University College of London established a diploma course in surveying. Ohio State University established (1950) The Institute of Geodesy, Photogrammetry and Cartography (graduate and postgraduate). The Polytechnic Institute of the University of Lausanne and Federal Institute of Technology at Zurich have highly specialized courses.

A Canadian University could follow one of three courses of action. One would be to introduce options in Civil Engineering which lead to B.S. degree. Another would be to set up a course leading to a B.S. degree in Surveying. Thirdly, set up a new (separate applied science) curriculum leading to the B.S. degree.

If only one institution in Canada provided a course leading to a B.S. degree, a number of problems would result. Principally, students will not take the course if it is offered at a location too remote from their homes. About one surveyor to twenty engineers is projected as a desired rate of supply. Several suggested assists to get Canadian students to subscribe to such a plan are offered.

The problem of securing the necessary education for surveyors is national in scope. The curriculum, source of students, increased staff (usually one) and the provision of funds constitute the problem for the universities. High academic standards must be maintained.

Professor deJong speculates on recognition of university standards by the examining commission, but adheres to the principle of examining for professional competence. This places the responsibility for academic competence on the university courses themselves. Thereby many very capable men in other fields would find themselves partially qualified and therefore might very well be attracted into surveying by a completion effort toward registration.

REMEMBER THE 1959 COMBINED MEETINGS OF ASP AND ACSM
WASHINGTON, D. C., MARCH 8–14, 1959

PLAN TO ATTEND

The Effects of User Requirements on Map Design

By JACOB SKOP

ARMY MAP SERVICE

TODAY, consumer research is an important factor in industry. The successful manufacturer recognizes that the customer usually has a good idea of what he needs and every year expends much effort to determine customer reaction to his products, be it an automobile or a can opener. Consumer needs affect the design of the product, and changing needs control the periodic modification or redesign of the product. These big business practices, if conscientiously applied, reflect the ideal manufacturer-customer relationship — the customer gets products which better satisfy his needs, and the manufacturer benefits through increased earnings.

While the profit-seeking aspect is absent, consumer research is just as applicable to the field of military mapping as it is to the field of commerce. A military map is just as much a product as an automobile or a can opener, and the military map user is just as much a customer as John Q. Public. Getting a map into the hands of a user is not enough; its design and contents must satisfy his needs.

As the primary mapping agent of the Department of Defense, the Army Map Service has always been sensitive to the needs of the military users of its products. It always recognizes the fact that the map is an important military weapon, whose improvement would result in more effective execution of military operations. Printing millions of maps yearly is not enough—they must be constantly subjected to improvement.

The global nature of World War II occasioned a revolution in military tactics and weapons. The changing user requirements demanded changes in the military map. The ever-increasing demand for maps during the war, however, allowed no interference with map production and while the military map maker was well aware that changes were in order, there was little he could do about it at the time. His opportunity came during the following brief respite from hostilities.

THE MILITARY GRID

An important feature on the map is the military grid. This system of squares is used to compute the range and direction of artillery fire from gun to target. It is used as a basis for identifying locations. It is used in survey work.

The military grid had its origin in the static trench-type warfare of World War I. Military activity was generally localized and the effective range of the most efficient artillery piece—the French 75—was about five miles. The experiences of World War I affected the evolution of subsequent military tactics. Out of this, for one thing, came the establishment of military grids. Requirements of concepts based on relatively restrained mobility were amply satisfied by the establishment of local military grids, each generally covering, at the most, a single country.

The movements of World War II were extremely fluid. Warfare covered a good part of the globe. The effective range of artillery increased considerably. Distances were shrinking. The 100-odd heterogeneous grid systems which covered the world, of necessity had to be used. Their use, however, created numerous difficulties and inconveniences which the user was forced to endure throughout the war. There was no continuity between grids and common points had different geographic identifications on adjoining grids since the grids

Presented at the 18th Annual Meeting of the American Congress on Surveying and Mapping. Washington, D. C., March 24–26, 1958.

were based on different spheroids, projections, and origins of coordinates. These factors adversely affected artillery fire and aircraft sorties. Additionally, it was difficult to identfy any position by unique coordinates.

Following World War II, the Army Map Service proceeded to satisfy this glaring user requirement. The result, which was the first of many major improvements to the military map, also took into consideration the changing user requirements of any future warfare. The Universal Transverse Mercator grid (UTM) was designed to replace the 100-odd heterogeneous grids with a grid system covering the world from 80° South to 80° North. The UTM grid was complemented by two Polar Stereographic grids for the polar areas to form a homogeneous grid system covering the entire globe. All the defects of the previous grids were thus eliminated at one fell swoop.

The new grid system served as a basis to satisfy another pressing user requirement —the need for providing a unique identification for any point on the globe. The Military Grid Reference System adequately satisfies this requirement.

The effectiveness of these two answers to military map user requirements is evidenced not only by the fact that they have been adopted by our own military forces, but also by the fact that they have been adopted by the NATO nations and others.

AN INTERNATIONAL DATUM

Map user requirements resulting from World War II dictated another great advance—this in the field of geodetic control. Maps of individual countries were based on national datums which often had no consonance with those of neighboring countries, differing in spheroids and in origin of triangulation networks. As long as warfare was confined to small areas this created no great problems. The rigid demands of a global war, however, found serious inadequacies in such a lack of compatibility.

The goal—almost Utopian—is for a common world-wide triangulation based on a single spheroid. The achievement of this goal is still far beyond the horizon, but much has been accomplished toward its attainment. One of the most significant accomplishments has been the European Adjustment in which the mapping of Western Europe has been placed on a common datum based on a common spheroid. All the NATO nations concerned have adopted this common datum. Similar progress is being made in the Western Hemisphere and in other areas.

STANDARD MAP SYMBOLS

The professional map maker finds it difficult to understand that the map user may have difficulty in reading a map. The language of symbols is second nature to the professional, but to the uninitiated map user it may appear as foreign as Senegalese. This user situation becomes particularly complicated if after having learned a bit of Senegalese he is suddenly confronted with a totally different language—Tibetan, Cambodian or Lapp.

This problem was forcibly brought to the fore during World War II. Practicality and the time element dictated the expeditious conversion of native maps without change of original symbols. Almost as many different symbol systems were represented as there were countries. The training period of the average American soldier allowed only a few brief hours for map reading. Few obtained more than a casual familiarity with the map symbols appearing on maps of the United States. Imagine the perplexities and problems of the map user when confronted with many different symbol languages, when he had not yet mastered the symbol language appearing on the maps of his own native land. The situation was further complicated by the fact that the allied users came from different countries, each of which had its own map-symbol language.

Shortly after World War II, steps were taken to alleviate this map user problem. The most important was standardization. First efforts of a committee set up to accomplish this were confined to standardizing the symbols appearing on maps prepared by the several Federal mapping agencies. The guiding principles were simplicity and self-explanatory symbols. The committee,

known as the Joint Mapping and Photographic Committee (JMPC), apparently did a good job for their agreements now serve as a foundation for the mapping specifications of all Federal agencies engaged in topographic mapping.

Even before the JMPC committee finished its work, the standardization movement spread. Initially, this concerned only the armed forces of Canada, Great Britain, and the United States, but it was not long before the military mapping agencies of all the NATO nations became involved. The point has now been reached where standard symbolization is being adopted by practically all of the western world. This means that the interpretation difficulties encountered by map users during World War II are being alleviated. In any future military operation it will be much simpler for the average allied soldier to read a map, regardless of his national origin.

NEEDS OF MILITARY MAP CUSTOMERS

Since World War II, much has been done by the military map maker to satisfy the requirements of the map user. Only the surface has been scratched, however, and much more remains to be accomplished. How to go about accomplishing this was a problem confronting the Army Map Service. The means to the end was found in American industry. Just as the manufacturer establishes an organization to ascertain his customers' requirements, so has the Army Map Service established the User Requirements Division to ascertain the requirements of military map users.

The User Requirements Division is not large and there is no need to make it so. Its personnel complement consists of eight civil service employees and two field-grade officers, both majors. Oddly enough for a Corps of Engineers installation, neither is an Engineer officer—one is of the Artillery and the other of the Infantry. This selection was intentional for they provide at first hand the means to interpret the mapping needs of two of the important Combat Arms. The officers serve on an equal basis with the civilians to make an effective working team carrying out the mission of the organization. This mission is to analyze existing and contemplated military methods and weapons systems and to determine what remedial measures are required in military cartography to satisfy current and future needs for military maps.

Once the User Requirements Division was organized, it was realized that its efforts would be ineffective unless an uinhibited statement of requirements could be obtained from the individual military map user. The average soldier is relutcant to disregard inhibitions if he knows that any paper he fills out will go through the hands of his superior officer. To avoid this, arrangements were made early to bypass channels and allow direct contact between Army Map Service representatives and individual map users. This procedure has operated very successfully.

The first major step was to conduct a comprehensive survey to obtain general data pertaining to map requirements. A detailed questionnaire was devised, covering the use of every feature and item shown on large-scale maps. A similar questionnaire was made for the 1:250,000-scale map.

Following a study of the distribution of military personnel, a selection was made of units to be surveyed. This selection provided a representative cross-section of military map users of all branches of the service and of all ranks—field-grade, company-grade, and noncommissioned officers. The number of participants was balanced in proportion to their relative use of maps. The units to be surveyed were stationed at major installations in the United States, Europe, and the Far East.

Operating on the obviously true premise that more valuable data and a truer cross-section of opinion can be obtained through direct contact, Army Map Service representatives visited the preselected units and personally conducted the surveys. The purpose of the survey was explained to the assembled groups and assurances were given that the completed questionnaires would be returned directly to the Army Map Service. These circumstances assured uninhibited statements of requirments.

These surveys resulted in approximately

4,400 completed questionnaires pertaining to the use of large-scale maps and approximately 2,200 pertaining to the 1:250,000-scale map. The questionnaires were consolidated to facilitate study. The completed questionnaires are not regarded as the final word. In practice, they are subjected to careful and continuous review to isolate problem areas which are to be given further study and investigation. The projects which result are given priorities reflecting the relative importance of the problems.

MAPS FOR PARTICULAR PROBLEMS

The nature of subsequent investigations depends upon the nature of the problem. This may involve additional questionnaires, correspondence, and visits to the field. In some cases, prototype maps, designed to solve particular problems, are taken to the field for evaluation. As a final step in each investigation, the findings are taken to the Service Schools and the U. S. Army Command and General Staff College and reviewed to assure compatibility with the military concepts and related tactics presently under development.

A number of such projects are currently nearing completion. It is premature to discuss these in detail, but indications are that they, and others to follow, will have material effect on the types, nature of content, amount of content, and the design of the military map. The goal is to supply the user with a map which will be easy of interpretation, legible under both favorable and adverse conditions, and contain all the information necessary for the execution of the user's mission. It is believed that the goal will eventually be approached. The user requirements program is being well received by the military map users, as evidenced by their expressed enthusiasm and whole-hearted cooperation.

The customer is doing his part and is letting the Army Map Service know what his requirements are. Continuation of this enthusiastic cooperation will definitely insure better maps for national defense.

LOCATE STAKES, MARKERS, MONUMENTS FASTER-MORE EASILY!

with the Time-Proved AQUA DIP NEEDLE LOCATOR

Here is the nation's most widely used locator that has helped utility companies for years to pinpoint hidden water and gas valve boxes quickly and effortlessly. The AQUA locator also is gaining ever increasing acceptance with surveyors, mappers and engineers, because of its simplicity, ruggedness and accuracy. Check the features below, then try the AQUA locator on the job for 15 days, FREE. Order, today.

LOOK AT THESE SUPERIOR FEATURES:

★ NO WIRES, BATTERIES or SWITCHES—Simple, powerful magnetic action, factory adjusted for YOUR geographical location, assures unfailing results!

★ NO NEEDLE SPINNING—Exclusive electric braking action saves you time!

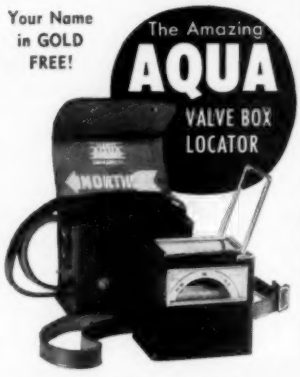
★ NO STOOPING — Easy top-view reading!

★ RUGGED, COMPACT, ACCURATE, CONVENIENT!

★ GUARANTEED — to function regardless of weather, surface or ground cover!

★ 15-DAY FREE TRIAL — No money! No obligation! You be the judge!

Your Name in GOLD FREE!



$29.50 F. O. B. CIN., O.

See Your Blueprint Dealer or Write Direct to:

AQUA SURVEY & INSTRUMENT COMPANY

2026 Leslie Avenue, Cincinnati 12, Ohio

The Need for Map Use Research

By ROBERT O. MAXSON

U. S. GEOLOGICAL SURVEY

THE OBJECTIVE of the Geological Survey topographic mapping program is to produce and maintain a uniform series of general-use topographic maps covering the United States and its Territories. Maps for general use are defined as those published at scales between 1:24,000 and 1:1,000,000 and designed to meet the needs of a large variety of specialists in several different professions and fields such as engineering, geology, military, reclamation, conservation, planning, civil defense, and forestry, to mention only a few. At the same time, general-use maps are designed to satisfy a large number of general or nonprofessional map users, such as sportsmen, vacationers, and farmers.

The design of maps that will fulfill the many diversified requirements as nearly as possible presents a continual challenge to the map maker. General-purpose maps should be based on a thorough evaluation of all essential requirements and at the same time be technically and economically sound and feasible.

To develop an improved and greatly enlarged consensus of map use needs, the Geological Survey recently established a Map Use Research Station in its Topographic Division. The responsibility for conducting a systematic study of map use and related problems has been assigned to this section.

Several fields of research and inquiry are presently contemplated. Principal map users will be identified and classified by profession, employer, and use. The "general" or the "man-on-the-street" type of map user also will be identified to the extent practicable, and his use of maps will be determined and evaluated.

One of the objectives of map use research is to minimize the need for remapping in the future. This will be achieved by determining present uses of mapping, anticipating future uses, and using this knowledge to design map standards that will be adequate over the foreseeable future. The determination of future uses as early as possible is particularly cogent in view of accelerated and extensive developments in the fields of science and technology. If maps are constructed with accurate bases and hypsography, content can be altered and replenished when necessary by revision. In this manner, the maps being produced now can be maintained indefinitely at a satisfactory level of quality.

The several series and scales of maps will be examined to ascertain the most desirable series range. For example, is the present 1:24,000—1:62,500—1:250,000 range more satisfactory than the 1:24,000—1:100,000—1:250,000 range? Content and accuracy factors for each series will be studied.

Among the fields of inquiry with regard to map content are:

(a) The requirements of construction engineers in the Federal agencies as well as State, local, and private engineers to determine how topographic maps are being used in design and construction. From studying these requirements, the need for either changing present map content or adding new items will be ascertained.

(b) The requirements of city engineers to determine whether or not the present urban area tint is being applied over too much or not enough area and if more or fewer street names and landmark buildings are needed.

(c) The requirements of hydraulic engineers throughout the country regarding

Presented at the 18th Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 24–26, 1958. Approved by the Director, U. S. Geological Survey.

additions and/or modifications to map content which would aid them in studying stream flow, beach erosion, underground water, and allied matters.

(d) The requirements of Federal, State, and local engineers for map maintenance, determining when and how often maps should be revised, and whether all features should be revised or just some of the more important.

(e) The requirements of State and county officials concerning their need for maps of urban areas, county maps, and other special-purpose maps which can be prepared from the standard quadrangle maps; also determine if such requirements are national or local in scope.

(f) The requirements of geologists to determine the best way to show certain terrain detail so as to facilitate their investigations.

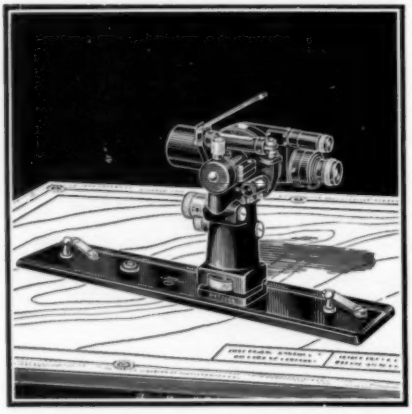
(g) The requirements of National and State foresters for data on woodland which might be shown by appropriate symbolization on topographic maps.

(h) The requirements of engineers and other map users for political boundary data including the printing of the names of Spanish Grants, and General Land Office data.

(i) The presentation of hypsography on maps of 1:62,500 scale and smaller by relief shading, tinting, or by other means.

(j) The requirements for State Maps, maps of the National Parks, and maps at a scale of 1:1,000,000 and smaller.

These are a few of the more important fields of research in map use that are envisioned at this time. As the accumulation of map users' requirements grows, undoubtedly the need to study the efficacy of various categories of content and symbolization, such as roads, buildings, or drainage, will lead to additional research projects.



Advanced-design Watts Microptic Alidades feature the exclusive pillar levelling action. Hinged at the base, the telescope axis can be rapidly levelled without tedious adjustment of the mapping table. A Watts first—A Watts exclusive. Try it . . . Compare it . . . Prove it.

WATTS MICROPTIC ALIDADES FINEST IN THE FIELD

For swift accurate field mapping and surveying, leading surveyors rely on the Watts Microptic Alidade. The Watts Alidade is highly accurate, compact, light weight, versatile and dependable. See the advanced-design Watts Microptic Alidade with exclusive pillar levelling at your nearby Dietzgen Dealer. Made by Hilger & Watts, Ltd., London; sold and serviced in the United States by the Eugene Dietzgen Co.

EUGENE DIETZGEN CO.

Chicago • New York • San Francisco • New Orleans
Los Angeles • Pittsburgh • Washington • Philadelphia
Milwaukee • Seattle • Denver • Kansas City • Cincinnati
Dealers in All Principal Cities

DIETZGEN

About Finding the Radius of a Circular Curve

By MICHAEL V. SMIRNOFF

ASSOCIATE PROFESSOR OF CIVIL ENGINEERING
NORTH CAROLINA STATE COLLEGE, RALEIGH, N. C.

TWO METHODS of finding the radius of a circular curve have been published recently in SURVEYING AND MAPPING. One method, giving the radius as

$$R = \frac{M}{2} + \frac{C^2}{8M},$$

was given in the January–March issue of 1956, p. 82. This method is exact and gives the radius in terms of any length of chord C and the middle ordinate M for the chord C.

Another method, published in the January–March issue of 1958, p. 102, gives

$$R = \frac{C^2}{8M}$$

and the degree of curve D computed from this value of R. This method admits approximation by merely neglecting the first term in the above given expression for R. However, since the first term is very small, as compared to the second term, the approximation gives remarkably close values of R and D. It has been also pointed out in the article that for $C = 67.70$ ft., $D = 10\ M$ (approx).

The table below gives the percent of error of obtaining D by this method.

D Degrees	R Feet	M Feet	$\frac{10M-d}{D}100$ in percent
60	95.49	6.20	3.3
30	190.98	3.04	1.3
15	381.97	1.51	0.7

This table shows that the error in computing D by the above method is negligible for the curves flatter than 15 degrees, since 0.7% error in computing D would also result from 0.01 ft. of error in measuring ordinate M, and one hundredth of a foot is just about as close as a middle ordinate may be expected to be measured.

A BETTER METHOD

It may be observed that in both methods given above, a chord and the middle ordinate for that chord must be measured. In other words, three points a, b, and c shown on figure 1 must be located on a curve.

As long as these three points must be located, one might as well measure middle ordinate M for the chord ac and also the chord $ab = B$. Then,

$$R = \frac{B^2}{2M} \text{ (exactly)},$$

since, from similar triangles shown on Fig. 1,

$$\frac{M}{B} = \frac{B/2}{R}.$$

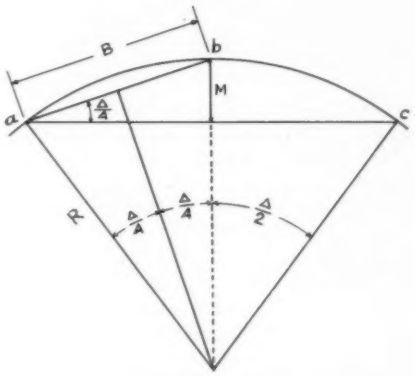


FIGURE 1.

It can be easily obtained from this equation that when $B = 47.873$ ft., the degree of curve $D = 5M$, where D is in degrees and M is in feet.

RADIUS OF A CURVE FROM TWO CHORDS AND INCLUDED ANGLE

When three points may be located on a circular curve, it may be required to determine the radius from the lengths of two

chords and a known angle between the chords. Let it be assumed that two chords $AB = b$ and $AC = c$, shown on figure 2, are given, together with the included angle $BAC = \beta$. The conventional solution for this problem, which may be found in some textbooks, is to solve triangle ABC for side BC and then to find the radius R from the equation $BC = 2R\sin\beta$. The writer believes that the solution shown below is shorter and easier.

Let α be the angle between the chord AB and the tangent at point A, figure 2. Then,

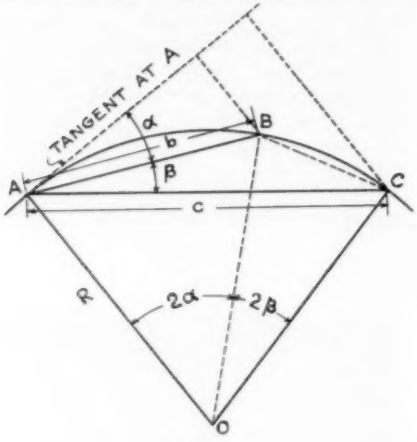


FIGURE 2.

from the figure $\sin\alpha = b/2R$ and $\sin(\alpha+\beta) = c/2R$. Dividing one equation by another, expanding $\sin(\alpha+\beta)$ and simplifying, the following expression may be obtained:

$$\tan\alpha = \frac{b\sin\beta}{c - b\cos\beta} \qquad (1)$$

Equation 1 gives a convenient expression for determining angle α and then the radius may be found from the equation $R = b/2\sin\alpha$. This solution is not affected by the size of angle β. It may be less or greater than 90°.

RADIUS OF A CURVE PASSING THROUGH A FIXED POINT

This problem may be found in practically every book on route surveying. However, the writer believes that a simple solution presented here has never been published.

Let it be required to find the radius of a circular curve passing through point P shown on Fig. 3. Let also point P be fixed by two distances x and y, as is shown on the figure, so that angle α must be equal to arc $\tan y/x$. Assuming that the intersection angle Δ is given, the problem reduces itself to finding angle θ subtended by the arc AP from $P.C.$ to point P.

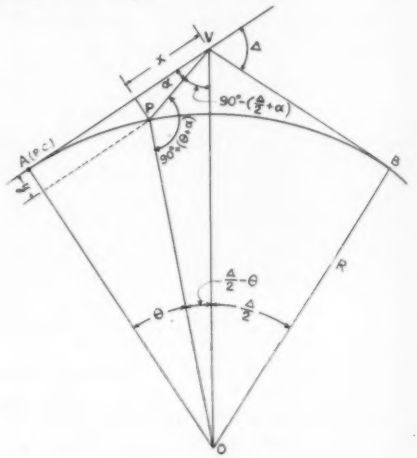


FIGURE 3.

All the angles in the triangle OPV are shown on figure 3 expressed in terms of angles α, θ, and Δ. Applying sine law to triangle OPV the following equation may be written

$$\frac{OP}{\sin PVO} = \frac{OV}{\sin OPV} \qquad (2)$$

Noting that $OP = R$, the radius of the curve, and that $OV = R\sec\Delta/2$, equation 2 reduces to the following expression:

$$\cos(\theta+\alpha) = \frac{\cos(\Delta/2+\alpha)}{\cos\Delta/2} \qquad (3)$$

Equation 3 will give $\theta+\alpha$ and since α may be determined from the given x and y distances, angle θ may be easily found. Knowing θ, the radius of the curve may be determined from the equation $y = R\,\mathrm{vers}\,\theta$, where $\mathrm{vers}\,\theta = 1 - \cos\theta$. Most surveying handbooks give tables showing versed sine functions of angles.

Trends in Coast and Geodetic Survey Compilation

By JOHN M. McALINDEN

COAST AND GEODETIC SURVEY

A MAJOR FUNCTION of the Coast and Geodetic Survey is the production of nautical and aeronautical charts and the compilation of topographic data for coastal areas included on nautical charts. The diversified characteristics of these charts and maps preclude uniform compilation and maintenance procedures. The maintenance problem is especially significant, and this is in many cases reflected in methods of compilation and reproduction. This paper outlines current procedures applicable to each of the three map and chart groups.

NAUTICAL CHARTS

A few pertinent facts about nautical chart compilation should be recognized:

(1) The nautical chart, unlike most other charts and maps, must be designed to permit a *continuous* maintenance cycle.

(2) Critical information, originating in many contributing agencies, must be applied continuously to the issued chart—either by hand corrections, printed overprints, or small "chartlets." The latter are small facsimiles of sections of the chart, on which are printed corrections too extensive to make by hand on the base chart. The printed chartlet is also included, as an insert, in the weekly *Notices to Mariners* and may be pasted over the affected area by the chart user.

(3) The rapid accumulation of essential and costly corrections necessitates frequent reissue of many nautical charts. In such instances corrections must be applied to the base negative before a new printing plate can be made. It is evident that the base negatives must be corrected frequently.

Presented at the Eighteenth Annual Meeting of the American Congress on Surveying and Mapping, Washington, D. C., March 24–26, 1958.

There are three basic types of nautical chart compilation: (1) smooth-drafted provisional charts, (2) mosaic compilations, and (3) manuscript compilations.

The terms *mosaic* and *manuscript* are arbitrarily defined in terms of nautical chart compilation. The former is a compilation consisting of photographic "reductions" of source material printed on matte finish stripper film, coated with a wax adhesive and fitted to a projection. *Manuscript* is used to describe an accurately compiled drawing lacking only artistic refinement to differentiate it from a smooth drawing.

Smooth-drafted Provisional Charts

When the need for a new chart is urgent a smooth-drafted "Provisional Chart" may be compiled for direct reproduction as follows:

(1) A Mercator projection is drawn mechanically on a dimensionally-stable grained plastic sheet. If a plane-coordinate grid is required, enough points of grid intersection are plotted to construct the grid manually.

(2) Landmarks, fixed aids, and other data, positioned by geographic or plane coordinates or bearing and distance, are plotted on the base projection.

(3) All selected charting data are converted to the compilation scale by one or a combination of the following methods: photography, pantograph, vertical projector, or proportional dividers. The resulting images or measurements are positioned to the base projection where all line work is smooth drawn.

(4) All stickup including symbols and geographic names, is positioned on this drawing. The compilation is reproduced, with minimum retouching, by the Reproduction Branch.

(5) That Branch later engraves the permanent chart on coated wet-plate negatives.

Mosaic and Manuscript Compilation

The first two steps of mosaic compilation are essentially the same as for direct reproduction. Step three differs in three respects. First, all source material to be photographed must be subdivided to the base-projection interval. Second, the negatives are made to a scale approximately one-half percent smaller than the compilation scale. Third, all photographed source material is printed on matte finish stripper film instead of waterproof paper or other type positive photo print.

For ease in handling and waxing, the negative film is reversed when the stripper film is made. This image reversal permits the application of adhesive wax without removing the film from the film base. The stripper is cut in units about one inch by eighteen inches or less. These are fitted to the base projection by stretching the slightly elastic film to match the base projection lines and adjacent detail. (Considerable projection and detail rectification is possible.)

After burnishing down these narrow strips a series of right angle cuts—about one-half inch square—are made through the stripper. This eliminates the problem of variable surface tension in the stripper film. Corrective or supplementary pen work with opaque ink may be made on the matte film or the uncovered areas of the drawing.

If the chart is to be scribed on a pigment-coated plastic sheet, the mosaic is contact-printed to it by the deep etch process. Any color of a lightly penetrating dye may be used. A whole series of overlapping mosaics or pen drawings can be superimposed, in distinctive colors, on the original printed image without damage.

After scribing, a black-line print is made on stable plastic and stickup is applied to it. Permanent wet-plate negatives are then made for final reproduction.

If the chart is to be engraved on glass, two variations are used in manuscript compilation. A blue-line contact print is made from the mosaic on the smooth side of a grained plastic sheet. Desired details are rough-drafted on the grained surface of the plastic. Stickup, either opaque or transparent, is applied to the manuscript compilation. Wet-plate negative are made of the drawing and are flow-coated with a pigment opaque that is subsequently removed by a solvent in the areas of stickup only. The second type of manuscript compilation employs the same methods used for direct reproduction—minus artistic drafting quality.

AERONAUTICAL CHARTS

The major classifications of aeronautical charts are *pilotage* and *instrument*. The first group contains information required for visual navigation, as well as much of the aeronautical data required for instrument navigation. Charts in the second category are designed specifically for instrument navigation.

The basic series in the pilotage group is the Sectional Aeronautical Chart with a base that is primarily a topographic map. These charts include carefully selected details of culture and relief necessary for identifying physical features from the air. The base is compiled as a manuscript with a separate color for each topographic classification. The manuscript, minus stickup, is sent to the Reproduction Branch where separation negatives are engraved for each color. Base negatives are revised for each printing. Type stickup is applied on transparent overlays which are later combined with the engraved negatives. This may be accomplished either by a washout process, prior to engraving, or by addition to the black-line print used as copy for wet-plate negatives. A composite blue-line print, made on drawing paper mounted on metal, is made from these negatives as a base on which to plot all aeronautical information.

Aeronautical information (or data) includes all types of electronic directional, positioning, and control aids, aeronautical limits, etc. This information is subject to constant change and compilation and maintenance procedures must reflect this fact. Of the many procedures tested to produce

copy, stickup proved most practicable. Symbols and type designed for direct use, singly or in combination, are available for practically all corrective problems.

On existing aero data negatives which are to be corrected, all revisions are indicated on matte finish photo positives, made at the preceding revision. An alternate method of revision applies corrections by stickup to a black-line print made on dimensionally-stable plastic from existing negatives.

COASTAL MAPS

The Coast and Geodetic Survey maps the coastal area of the United States and Territories to provide basic data for the production and maintenance of nautical charts. This mapping is done by photogrammetric methods, and the maps, usually at scales of 1:10,000 or 1:20,000, are either planimetric or topographic, depending upon chart needs. A manuscript map is first produced in the form of a rough drawing on stable plastic sheeting. A smooth drawing or engraving of the manuscript is then made to provide clear, legible copy for the archives, where each map is filed as a survey record. Photographic copies are issued to the public and to other agencies, at the cost of copying, and are widely used for engineering purposes.

To summarize, the use of dimensionally-stable plastics, plus techniques developed to produce images on them, is perhaps the most significant development in the field of chart compilation in the past fifteen years. Scribing, for both compilation and reproduction, has many applications, and in most instances replaces smooth drafting as a process. These two important developments do not, however, supersede glass-negative engraving, stickup, or other graphic techniques. They supplement rather than supplant.

Washout of successive blackline prints or drawings to produce glass or plastic negatives, by contact, is one of the promising newer developments.

Another recent technique—Etch-strip negatives—eliminates time-consuming artist or compilation labor. An "etched" image of the limiting lines of the tint is prepared mechanically on coated plastic and a negative is obtained by stripping away the coating.

In conclusion, we in the compilation field are always seeking new methods to improve our product. The American Congress on Surveying and Mapping is proving one of the indispensable elements needed to reveal these new methods—on open forum representing all phases of our industry.

❦ ❦ ❦

Swiss Mapping Exhibit

A mapping exhibit showing the various phases of the highly developed mapping techniques used in Switzerland was open to the public in the lobby of the Department of Commerce Building in Washington, D.C., from July 22 to August 15, 1958. Sponsored by the Coast and Geodetic Survey, the exhibit consisted of 19 panels which illustrated the mapping activities against a background of the Swiss Alps. It brought out the fact that in that rugged country mapping requires not only highly developed technical knowledge and instruments but considerable courage as well as athletic ability.

Prepared by the topographic services of the Swiss Federal Military Department, the exhibit contained a historical document of considerable importance—the oldest complete map of Switzerland.

Switzerland, which is probably the best mapped country in the world, has a cartographic history which dates back to the 15th century. After more than four and one-half centuries, the mapmakers have long since covered the slightly less than 16,000 square miles which make up that mountainous inland country. Now the Swiss can only refine the present mapmaking techniques to meet the demands of a modern world.

The exhibit was previously displayed at the Boston Science Museum, and, as a result of Swiss experience in mapping mountainous areas, the topographic division of the Swiss Federal Military Department, in collaboration with the Swiss Foundation for Alpine Research, has been employed by the Boston Science Musem to produce a map of Mount McKinley, North America's highest peak.

Surveying and Mapping News

Members are requested to send in surveying and mapping news items for publication in SURVEYING AND MAPPING.—EDITOR.

CURRENT SURVEYING AND MAPPING LITERATURE

MAGAZINE ARTICLES

General Interest

WHAT IS THE FUTURE OF LITHOGRAPHY? Hon. Raymond Blattenberger, Public Printer of the U. S., *Modern Lithography*, Vol. 26, No. 5, May 1958. (Discusses the history of lithography in the Government Printing Office and predicts future developments and refinements.)

RADIO FACSIMILE WEATHER MAPS. Commander L. E. Truitt. *Marine News*, Vol. 44, No. 11, May 1958. (Describes first routine use of radio facsimile equipment to obtain weather reports aboard ship.)

DEPARTMENTAL ANNUAL REPORT. New Zealand Department of Lands and Surveys, year ending 31 March 1957. *New Zealand Surveyor*, Vol. 22, No. 3, February 1958. (Summary of principal portions of report.)

TIME MANAGEMENT FOR THE ENGINEER EXECUTIVE. Luis J. A. Villalon. (Reprinted from *Research and Engineering*), *Journal, Florida Engineering Society*, Vol. 11, April 1958.

LIBRARY SERVICE FOR FLORIDA ENGINEERS. Lynn Walker. *Journal, Florida Engineering Society*, Vol. 11, No. 6, 1958. (Elaborates on the theme that "The Half of Knowledge is to Know Where to Find Knowledge.")

GEODESY AND THE SATELLITES. Colonel Frederick O. Diercks, C.E. *The Military Engineer*, Vol. 50, No. 335, May–June 1958. (Discusses value of satellites in studying the shape of the geoid and describes the Minitrack system of satellite observation.)

POLARIS AND THE MERIDIAN. Commander Charles J. Merdinger, C.E.C., U.S.N. *The Military Engineer*, Vol. 50, No. 335, May–June 1958. (Interesting brief history of the origins of surveying, early instruments, and the establishment of Polaris as the pole star.)

DASHING AND DUTIFUL. David S. Evans. *Science*, Vol. 127, No. 3304, April 25, 1958. (Interesting account of the astronomical and geodetic work of Sir John Herschel and Sir Thomas Maclear in the Union of South Africa during the 1830's.)

RIPPLE ROCK: THE END COMES WITH A BANG. George Reynolds. *Dupont Magazine*, Vol. 52, No. 3, June–July 1958. (Story of the destruction by explosives of a long-standing hazard to navigation in Seymour Narrows, B. C., on the Inside Passage to Alaska.)

HYDROGRAPHIC SURVEYS IN THE ARCTIC. T. K. Treadwell, Commander, U.S.N. *The Military Engineer*, Vol. 50, No. 334, March–April 1958. (General account of operations in an area never completely surveyed to facilitate shipping operations in connection with supplying DEW line and other installations in the lower portion of the Canadian Arctic Archipelago.)

LOCATING OUR COASTAL BOUNDARIES. Donald B. Clement. *Our Public Lands*, Vol. 8, No. 1, July 1958. (Discussion of problems involved in determining limits of State and Federal jurisdiction of offshore areas.)

NATION'S CAPITAL ENLARGES ITS SEWERAGE SYSTEM. C. Frank Johnson. *Civil Engineering*, Vol. 28, No. 6, June 1958. (Part 1 of a study on "Abating Pollution of the Potomac River.")

ELECTONIC COMPUTATIONS FOR HYDROGRAPHIC SURVEYS. Benjamin E. Beavin, Sr. *The Military Engineer*, Vol. 50, No. 335, May–June 1958. (Describes an ingenious combination of graphics and electronic computations in determining quantities of dredged material in an underwater borrow area.)

STANDARDIZATION OF THE INCH. A. V. Astin. *The Military Engineer*, Vol. 50, No. 335, May–June 1958. (An illustrated article on the proposed 2.54-centimeter inch, in which the mapmaker and his interest in the matter are considered.)

POLARIS AND THE MERIDIAN. Commander Charles J. Merdinger, Civil Engineer Corps, USN. *The Military Engineer*, Vol. 50, No. 335, May–June 1958. (An illustrated article on the history of the use of Polaris by astronomers and navigators through the ages.)

Cartography

RAILROADS MAP THE WEST. F. R. Weinrich. Geography and Map Division, Special Libraries Association, Bulletin No. 32, April 1958. (Brief history of Pacific Railroad Surveys with comparison of map of west by Topographic Engineers and map covering same area revised on basis of the railroad surveys.)

IN DEFENSE OF DRAFTING. John W. Titus. *Engineering News Record,* Vol. 160, No. 20, May 15, 1958. (Adapted from *HNTB News,* House Organ of Howard, Needles, Tammen & Bergendorf, consulting engineers, Kansas City, Missouri.)

BREAD AND BUTTER MAPS. Ernest B. Worth, The *International Blue Printer,* Vol. 31, No. 7, July 1958. (Describes techniques in production of large-scale city plans.)

CARE AND DEVELOPMENT OF A WALL MAP COLLECTION. Howard G. Roepke. *The Professional Geographer,* Vol. 10, No. 3, May 1958. (Suggestions concerning a difficult storage problem.)

Control Surveys

NOTES ON THE TELLUROMETER, STRATUM TITLES, AND THE VISIT BY PROFESSOR SCHERMERHORN. Contributed by Melbourne Division, Australia Institution of Surveyors. *The Australian Surveyor,* Vol. 16, No. 8, December 1957. (Miscellaneous information.)

REPORT ON TELLUROMETER TESTS. G. R. L. Rimington. *The Australian Surveyor,* Vol. 16, No. 8, December 1957. (Describes experiments to determine accuracy under normal conditions, probable range, and suitability of the equipment for use by normal field survey personnel.)

A TOPOGRAPHIC MAPPING PROGRAMME FOR NEW ZEALAND. William Seaton Boyes. *New Zealand Surveyor,* Vol. 22, No. 3, February 1958. (Discusses controlling factors, requirements of a mapping organization, and offers a specific program.)

GEODETIC CONTROL SURVEYS IN NORTH CAROLINA. Michael V. Smirnoff. *North Carolina Engineer,* Vol. 14, No. 3, April 1958. (Discusses work accomplished and suggests specific duties of a permanent State agency in charge of geodetic control surveys in the State.)

THE TELLUROMETER IN FIELD SURVEY OPERATIONS. *The Canadian Surveyor,* Vol. 13, No. 10, October 1957. (A symposium. Papers by several authors describing field results of Tellurometer surveys in various localities.)

GEODESY AND THE SATELLITES. Col. Frederick O. Diercks, Corps of Engineers. *The Military Engineer,* Vol. 50, No. 335, May–June 1958. (An illustrated article on the uses to which artificial satellites may be put in furthering the study of the figure of the earth and the more precise mapping of the earth's surface.)

ELECTRONIC COMPUTATIONS FOR HYDROGRAPHIC SURVEYS. Benjamin E. Beavin, Sr. *The Military Engineer,* Vol. 50, No. 335, May–June 1958. (Describes method applied to a bulkheading and filling project at the U. S. Naval Academy; comment by Lansing G. Simmons, C&GS.)

CONVERSION FROM SHORAN TO HIRAN. S. A. Yaskowich. *The Canadian Surveyor,* Vol. 14, No. 1, January 1958. (Summarizes experience in overcoming difficulties in conversion.)

SIMPLE ADJUSTMENT OF SURVEY FIGURES. T. Siurna. *The Canadian Surveyor,* Vol. 14, No. 1, January 1958. (Discussion of methods in computing "fill nets" in triangulation computations.)

Education

PROFESSIONAL DEVELOPMENT AND ENGINEERING EDUCATION COMMITTEE REPORT. T. C. Heyward, Jr. *North Carolina Engineer,* Vol. 14, No. 3, April 1958. (Discusses past activities and proposes additional activity along various lines.)

THE EDUCATION AND TRAINING OF THE LAND SURVEYOR IN NEW ZEALAND. J. B. Mackie. *New Zealand Surveyor,* Vol. 22, No. 3, February 1958. (Offers some criticism of the present system of training and concludes that a diploma course rather than a degree course is more desirable at the present time.)

A DIPLOMA COURSE IN TOWN PLANNING. Prof. R. T. Kennedy. *New Zealand Surveyor,* Vol. 22, No. 3, February 1958. (Indicates problems of town planning which involve more than the work of the architect or of the land subdivision by surveyors.)

EDUCATION IN THE STRUGGLE FOR EXISTENCE. R. H. Helms. *North Carolina Engineer,* Vol. 14, No. 3, April 1958. (Some comparisons between United States and Soviet systems of engineering education.)

HISTORICAL REVIEW OF EDUCATIONAL ACTIVITIES OF NORTH CAROLINA SOCIETY OF ENGINEERS. Dr. John D. Watson. *North Carolina Engineer,* Vol. 14, No. 3, April 1958.

WHAT SHOULD AN ACADEMIC EDUCATION FOR SURVEY ENGINEERS BE AND WHY? T. J. Blachut. *The Canadian Surveyor,* Vol. 13, No. 10, October 1957. (Suggests desirable academic courses and offers a proposed syllabus in tabular form.)

OUR PROFESSIONAL RESPONSIBILITY—DEVELOPMENT OF NEW KNOWLEDGE. Martin A. Mason. *Civil Engineering,* Vol. 28, No. 6, June, 1958. (Points up lack of educational information from engineering profession in recent months.)

Instruments

NRL'S 50-FOOT RADIO TELESCOPE. J. E. Sees. *Research Reviews,* (Office of Naval Research), March 1958. (Describes gigantic instrument for study of electromagnetic radiations occurring in the universe.)

DEVELOPMENT OF PHOTOGRAPHY, CAMERAS, AIRCRAFT AND CAMERA MOUNTS. Wing Commander Harold Pearce. RCAF. *The Canadian Surveyor,* Vol. 13, No. 10, October 1957. (Mainly a history of the tools of aerial photography with some technical suggestions for future development.)

THE TELLUROMETER FOR CONTROL SURVEYS. John H. Brittain, Captain, C&GS. *The Military Engineer,* Vol. 50, No. 334, March–April 1958. (Description of the instrument and results obtained in comparison with other methods of distance measurement.)

Property Surveys

TOWN PLANNING AND THE SURVEYOR. H. L. Westerman, Assistant Commissioner for Town and Country Planning in Tasmania. *The Australian Surveyor,* Vol. 16, No. 8, December 1957. (An address on the economic and social effects of subdivision.)

IRRIGATION FARM DEVELOPMENT. M. S. Williams. *New Zealand Surveyor,* Vol. 22, No. 3, February 1958. (Report on a survey test plan of a rural development.)

THE STATUTES RELATING TO SURVEYS AND SURVEYORS IN CANADA. W. Humphreys. *The Canadian Surveyor,* Vol. 14, No. 1, January 1958. (Comments on the Canada Land Surveys Act.)

BOOKS AND PAMPHLETS

THE FEDERAL BASIS FOR WEIGHTS AND MEASURES. National Bureau of Standards Circular 593. (A historical review of Federal legislative effort, statutes, and administrative action in the field of weights and measures in the United States.) Available from the Government Printing Office, Washington 25, D. C. Price 30 cents.

MODERN SURVEYING. (New Edition.) Harold Frank Birchal. *Philosophical Library, Inc.,* 15 East 40th St., New York 16, N. Y. $15.00.

Middleton and Chadwick's *A* TREATISE ON SURVEYING. (Sixth Edition.) Vol. I, Instruments and Basic Techniques; Vol. II, More Advanced Techniques and Developments. Rewritten under the editorship of W. Fisher Cassie. *Philosophical Library, Inc.,* 15 East 40th St., New York 16, N. Y. $20.00.

CAREER 1958 FOR THE EXPERIENCED ENGINEER AND SCIENTIST. William H. Ottley, Editor. Careers, Incorporated, 15 West 45th Street, New York 36, N. Y. 64 pp., illus.

"CHALLENGER": THE LIFE OF A SURVEY SHIP. George Stephens Ritchie (Capt. R.N.) xxi & 249 pp., illus. Hollis and Carter, London, 1957.

THE LITHOGRAPHERS MANUAL. Volume I. Victor Strauss, Editor. Waltwin Publishing Company, 317 W. 45th Street, New York 36, N. Y. 583 pp., inserts. Vols. I and II, $25.

MAN'S ROLE IN CHANGING THE FACE OF THE EARTH. William L. Thomas, Editor. University of Chicago Press, 1956. 1193 pp. $12.50.

THE MEASUREMENT OF SMALL ANGLES USING OPTICAL-READING THEODOLITES AND AMERICAN-DESIGN TRANSITS. Leland Barclay. University of Texas publication No. 5701, Engineering Research Series No. 47. 17 pp., illus.

GRAVITY CONTROL MEASUREMENTS IN NORTH AMERICA. Coast and Geodetic Survey Publication 63-1. Available from the Superintendent of Documents, Washington 25, D. C. Price 15 cents.

PLANE COORDINATE INTERSECTION TABLES—ARKANSAS. Coast and Geodetic Survey Publication 65-1, Part 3. Available from Superintendent of Documents, Washington 25, D. C. Price 45 cents.

PLANE COORDINATE INTERSECTION TABLES—SOUTH CAROLINA. Coast and Geodetic Survey Publication 65-1, Part 38. Available from Superintendent of Documents, Washington 25, D. C. Price 40 cents.

PLANE COORDINATE INTERSECTION TABLES—VIRGINIA. Coast and Geodetic Survey Publication 65-1, Part 44. Available from Superintendent of Documents, Washington 25, D. C. Price 45 cents.

YEARBOOK OF REGISTERED ENGINEERS AND LAND SURVEYORS, 1958. Board of Professional Engineers and Land Surveyors, New Orleans, Louisiana, 1958. 128 pp.

INDEX TO GEOLOGIC MAPS OF CALIFORNIA. R. G. Strand, J. B. Koenig, and C. W. Jennings. State of California, Department of Natural Resources, Divisions of Mines. Special Report 52, San Francisco, June 1958. 128 pp., maps. $1.

PROCEEDINGS OF CONFERENCES ON LAND SURVEYING HELD AT PURDUE UNIVERSITY. Compiled and edited by Ken S. Curtis, Assistant Professor of Surveying and Mapping. Engineering Extension Department, Extension Series No. 93, Purdue University, Lafayette, Indiana, January 1958. 128 pp., maps, extended bibliography.

—LYMAN D. LYNN

Coast and Geodetic Survey

DISTINCTIVE RECENT MAPS

An interesting new tool for teaching geography and illustrating land forms is the *Aero Relief Model of Geographical Terms,* published in 1958 by Aero Service Corporation of Philadelphia. A hypothetical plastic map, in three-dimensional relief, portrays a variety of physical landforms ranging from oceans and shore features to elevated mountain ranges. A number of cultural features are also shown and named on the map. Below the relief model the names of physical and cultural forms are arranged alphabetically and defined. The *Aero Relief Model* measures 42 by 47 inches.

Two small but useful maps published early in 1958, have been received from the United Nations. Both are available in English or French editions. Figure 1 shows *Major Drainage Areas of the World.* River basins of more than 1,000,000 square kilomteers, and of 100,000 to 1,000,000 square kilometers are shown in different colors. Arid areas and regions of permafrost are also outlined.

International River Basins are located on Figure 2. Three color categories outline basins of (1) more than 1,000,000 square kilometers, (2) 100,000 to 1,000,000 square kilometers, and (3) less than 100,000 square kilometers. Individual basins are listed in a legend which is keyed by numbers to the appropriate locations on the map.

The scale of both maps is 1:80,000,000 and the sheet sizes are 11 by 22 inches.

A recently published United States map delimiting the administrative divisions of the Methodist Church for the conference year 1957–58 is entitled *Geographical Boundaries—Jurisdictions, Episcopal Areas, Annual Conferences and Districts of the Methodist Church.* It was copyrighted in 1958 by Lovick Pierce and published by Together and The New Christian Advocate, 740 North Rush Street, Chicago 11, Illinois. Jurisdictions, Areas, Conferences and Districts, are listed at the bottom of the sheet and keyed to numbers on the map. The map proper measures 19 by 30 inches and is at the approximate scale of 1:6,250,000.

The TVA Power System locates existing and authorized power plants and transmission lines, interconnecting lines, and service areas of municipalities and cooperatives within the jurisdictional limits of the Tennessee Valley Authority. It is at the approximate scale of 1:260,000 and measures 10 by 14½ inches. The map was compiled by the Maps and Surveys Branch [TVA].

A contour map of the *State of Kentucky,* at the scale of 1:500,000, is a 1958 publication of the U. S. Geological Survey. Based on the large scale topographic quadrangles, now available for the entire state, the map shows considerable relief detail with a contour interval of 200 feet. County boundaries are clearly outlined in green, and the major highways are shown. The map sheet measures 27 by 57 inches.

A preliminary map showing *Agricultural Regions of New York State,* was published in February 1958 by the New York State College of Agriculture, Cornell University, Ithaca, New York. It was compiled by K. C. Nobe, E. E. Hardy, and C. P. Gratto under the direction of H. E. Conklin. The map measures 8½ by 11 inches. Thirteen regions are outlined on the map and briefly described on the verso of the sheet.

The Michigan State Highway Department published in 1957 two traffic maps of the State's trunkline system of highways. Both are at the approximate scale of 1:900,000 and measure 30 by 31 inches. One shows *Average 24 Hour Commercial Traffic on the Trunkline System 1957,* and the other presents the *Average 24 Hour Traffic Flow on the Trunkline System 1957.* Both include insets showing cities and vicinities at a larger scale than on the main maps.

Two additions to the U. S. Geological Survey's growing list of attractive and colorful shaded relief maps have been published. *Pikes Peak and Vicinity, Colo.,* is at the scale of 1:62,500 and measures 32 by 32 inches. On the verso of the map sheet is printed "The Geologic Story of Pikes Peak and the Surrounding Regions," which is illustrated with several structural sections and photographs of scenic attractions.

The city of Colorado Springs and the adjacent portion of the High Plains occupy the eastern quarter of the map, while the remainder embraces the Front Range and North, Middle, and South Parks. Copies of the shaded relief map, as well as the contour edition of the Pikes Peaks map, are for sale by the U. S. Geological Survey, Denver 2, Colorado, or Washington 25, D. C.

Sequoia and Kings Canyon National Parks, California is another recent shaded relief map. The contour edition of this map was published in 1937. The new map is at the scale of 1:125,000 and measures approximately 40 by 32 inches. The combination of contour lines and skillful brown shading brings out the rugged, mountain and canyon relief of this picturesque region. The eastern section of the sheet shows a striking contrast between the flat-floored Owens Valley (elevation, 3800 ft.) and the crest of Mt. Whitney at 14,495 feet.

An oblique perspective map, issued in 1958, by Irrigation Districts Association of California (945 Pacific Building, San Francisco) presents the plan for the *California Water Resources Development.* Included are the programs of the Bu-

reau of Reclamation, Army Corps of Engineers, major features of the California water plan, and various projects of districts and municipalities. The map measures approximately 26 by 37 inches. Marginal text describes the various projects.

J. Thomas Dutro, Jr., and Thomas G. Payne are the compilers of a *Geologic Map of Alaska* published in 1957 by the U. S. Geological Survey. Copies, at $2.00 each, may be ordered from the Survey Offices in Denver or Washington, D. C. The map is at the scale of 1:2,500,000 and measures 36 by 60 inches. More than 50 formations, ranging from Pre-Cambrian to Quaternary, are identified. A small index map shows principal sources for data used in compiling the geologic map.

The *Glacial Map of Canada 1958,* is a publication of the Geological Association of Canada. It is published with support from the Geological Survey of Canada, the Defense Research Board, and the National Research Council [of Canada]. The map, at the scale of 1:3,801,600, is on a base prepared by the Department of Mines and Technical Surveys. The sheet measures 50 by 62 inches. An inset map shows Rock Outcrops and Drift Cover of the Canadian Shield. Copies of the *Glacial Map* may be ordered at $2.00 per copy ($1.00 to students) from the Geological Association of Canada, Room 703, 111 St. Clair Avenue, West, Toronto 7, Ontario, Canada.

Forest Classification of Canada is a 1957 publication of the Forestry Branch, Department of Northern Affairs and National Resources, Canada. Ten different forest types, as well as grassland and tundra regions are delimited. The map measures 24 by 38 inches and is at a scale of 100 miles to 1 inch.

Service de la Cartographie Économique, Ministère de l'Industrie et du Commerce (Quebec, Canada) is the publisher of *Province de Quebec, Regions Economiques, Cities et Villes, le 1er Juin 1956.* Ten economic zoning regions are delimited. The map measures 24 by 37 inches and is at the approximate scale of 1:1,200,000.

Venezuela Oil Fields and Concessions was issued as a supplement to the August 15, 1957 issue of *World Oil* magazine (P. O. Box 2608, Houston 1, Texas). The map, at the scale of 1:2,500,000, illustrated a report by Warren Baker, editorial director of the journal. Oil fields, oil concessions (granted prior to 1946, and since July, 1956), oil and gas pipe lines, oil basins, gas injection plants, and oil refineries are shown. Graphs picture Venezuela's monthly oil production (1955–1957) and crude oil reserves (1949–1956). The map measures 15 by 25 inches.

An attractive and colorful shaded relief map of Britain's picturesque and historical *Lake District* is a 1958 publication of the Ordnance Survey, Chessington, Surrey. It is at the scale of 1:63,360 and is printed on a sheet measuring 43 by 34 inches. The *Lake District* map was compiled from several sheets of the "One Inch Seventh Series" of the Ordnance Survey, and includes all the physical and cultural details found on maps in that series. Designed for use by tourists, the map should prove to be an extremely popular guide to all who visit the Lake District.

An industrial, mineral, power, land utilization and communications map of Switzerland, Austria, and Czechoslovakia (*Suisse–Autriche–Tchecoslovaquie*) was published in 1956 by Direction de la Documentation, [French] Ministere des Finances et des Affaires Economiques. Colors and symbols portray the varied economic resources and commercial developments in this central European region. The map was compiled by Charles Guy. The scale is 1:1,500,000 and the sheet measures 16½ by 35 inches. There is an enlarged inset of Switzerland at the scale of 1:000,000.

A four-sheet geologic map of the Soviet Arctic (*Geologicheskaia Karta Sovetskoi Arktiki*), at the scale of 1:2,500,000, was published in 1957 by Nauchno-issledovatel'skii Institut Geologii Arktiki, Moscow. It was compiled under the editorial direction of D. B. Nalivkin and F. G. Markov. Each sheet measures 18 by 26 inches. There is an inset map showing the geology of Wrangell Island (Ostrova Vrangelia) at the scale of 1:1,500,000. The legend includes some 85 formations ranging from Mesozoic to Quaternary.

The Directorate General of Surveys, Baghdad, published in 1957 a *Provisional Geological Map* of Iraq, at the scale of 1:2,000,000. The generalized map shows nine formations ranging from Paleozoic to Pleistocene. The map was compiled by the Iraq Geological Department from published and unpublished data from official and unofficial sources. The measurements of the map are 19 by 18 inches.

Mineral resources of Japan are featured on two maps published in 1957 by the Geological Survey of Japan. Both are at the scale of 1:2,000,000 and measure approximately 40 by 30 inches. On the *Coal Fields of Japan* are located the coal producing areas of the Japanese Empire. Pie-graphs, located adjacent to the regions give production statistics.

The second map is entitled *Mineral Province of Japan, I. Mineralization of Quaternary Period.* On it are located sulphur, limonite, manganese, lateritic nickel, phosphorite, and placer deposits. Title and legend for both maps are in Japanese and English.

The towering peaks and glacier-filled valleys of the most elevated part of the Himalaya Mountains are portrayed on a new 1:25,000 map of *Chomolongma-Mount Everest,* published by Freytag-Berndt and Artaria of Vienna, Austria. This

detailed and attractive map was prepared under the cooperative sponsorship of the Deutscher Alpenverein, Deutscher Forschungsgemeinschaft, and Osterreichischer Alpenverein. Data used in compiling the map were derived from a number of sources and published maps, supplemented by original surveys promoted by the Osterreichischer Alpenverein. The Chomolongma-Mount Everest map was issued as a supplement to the April, 1958 issue of Zeitschrift Zür Vermessungswesen (Stuttgart, Germany). This issue of the journal includes articles pertaining to the map and its preparation by R. Finsterwalder and E. Schneider, and Fritz Ebster. The map sheet measures 31 by 39 inches. Title and legend are in German and English.

A welcome recent accession is a map of the new country of *Ghana*, formerly the Gold Coast Colony. It was published by the Survey Department, Accra, in 1957. The scale is 1:1,500,000 and the dimensions are 24 by 16½ inches. International, regional, and district boundaries, as well as railroads and several classes of roads are shown.

The *Gravity Map of the Union of South Africa* (1958) shows gravity data overprinted on the Geological Map of the Union published in 1955. The new four-sheet map was prepared under the direction of Dr. F. C. Truter, and printed by the Government Printer in Pretoria, from whom copies may be ordered (Price £ 1–4). Each sheet measures 28½ by 38 inches, and the scale of the map is 1:1,000,000.

The Natural Livestock Regions of South Africa are delimited on a colorful map, compiled by F. N. Bonsma and D. M. Joubert, and published in 1957. Title and legend are in English and Afrikaans. Natural vegetation is shown by color and symbols and pictorial representations indicate the areas where the different forms of livestock predominate. The map measures 31 by 40 inches.

—Walter W. Ristow

Library of Congress

color tints
Contak
shading films
CONTAK screens and symbols — surface printed patterns on clear "Mylar"*. Areas easily removed where desired. Heat resistant non-wax pressure adhesive leaves no residue. Equally good for photographic or blueprint repros. 85¢ per sheet. Ask your blueprinter, art-drafting supply dealer or write for literature.
*Now on MYLAR — Du Pont's registered trade mark for their polyester film. Extremely tough, it assures permanence and dimensional stability.
lithological symbols
TRANSOGRAPH
A Division of
CHART-PAK, INC. • Leeds, Mass.

The Surveyor and the Law

The Surveyor in Court

By CURTIS M. BROWN

DANIELS, BROWN & HALL, SURVEYORS & ENGINEERS, SAN DIEGO, CALIFORNIA

Introduction. The very nature of surveying makes it probable that the property-line surveyor will occasionally be a witness or a litigant in court. When a surveyor is called upon to monument a property line it may happen that one of the adjoiners will disagree with his monumented line location and will refer the matter to the courts. The adjoiner might claim ownership due to a line of possession or he might claim the surveyor erred. But whatever his claim, the dispute will probably end in court and the surveyor will be a witness.

Without disagreement, investigation and experiment would cease. The arts and sciences have progressed because people disagreed with the old methods and have advanced new ideas. Not all disagreements are objectionable. Because of disagreement of opinion, the judge of the higher court sometimes reverses the opinion of the judge of the lower court. In fact, many attorneys depend upon differences of opinion for their very livelihood. Disputes have been with people and will continue to be with them. Likewise, it is reasonable to expect that surveyors will occasionally disagree, and litigation will sometimes be created because of such differences of opinion. Honest differences of opinion based upon sound reasoning from the true facts in evidence may be considered as a healthy condition.

The surveyor has many opportunities for errors. He may make a wrong measurement or calculation, and thus be the cause of a costly mistake. Such errors, unless voluntarily settled by the surveyor, usually end in a damage suit.

In some States, such as California, whenever a judge feels that the court needs the services of an expert to aid in interpreting or observing facts, it may appoint an expert on its own motion. Thus, the surveyor, as an expert, might serve the court.

From this discussion, it can be concluded that all actively engaged property-line surveyors must expect, at some time, that they will be called upon to appear as a court witness. In this paper, it is presupposed that the surveyor is a witness, not a litigant.

Duties of a Surveyor in Court. In litigation involving land boundaries, the surveyor is a witness, either lay or expert. He has no function other than as a witness describing facts within his perception, or as an expert witness expressing opinions within his special field.

In the practice of surveying, the client asks the surveyor to give him a *solution* to a particular boundary problem. The surveyor works until he finds a solution and presents the results to the client. In a court case the surveyor is a witness who presents the facts, and the court decrees the solution. Thus, in court cases the surveyor must change his mode of thinking and always remember that it is not he who is solving the problem. He is a witness.

Court Trials. All of the procedures and methods used in court trials, though interesting, are not of vital importance to the surveyor. Since the surveyor is a witness, it is important that he know how to properly conduct himself as a lay or expert witness. And it is important that he know what fees, if any, he is entitled to. These items will be discussed.

Pre-trials. Pre-trials, as practiced in some States, are for the purpose of eliminating unnecessary court time and are an attempt to reach agreement on what are the issues in the case. The attorneys and the judge, in conference, discuss the issues and agree upon which points evidence will be taken. At this time the judge or the attorney for either side may ask for an expert witness. Often they are appointed in boundary disputes.

Presented at the San Joaquin Valley Surveyors Conference, Fresno State College, Fresno, California, April 4–5, 1958.

Oath, Questions and Answers. Prior to testifying, a witness is placed under oath to tell the truth, the whole truth, and nothing but the truth. This does not mean that the witness is to volunteer information and ramble along on any subject that he thinks might have a bearing on the case. He is to answer questions put to him. If the answer to a question results in a half truth and the witness feels that further information should be given, and yet the information is not called for by the question, he may ask permission of the court to clarify his answer. The reason testimony is in general limited to the answering of questions is that the court wants to know in advance whether the subject matter the witness is to talk about is admissible evidence. Also the opposing side has opportunity to object if the question asked is improper.

Direct and Cross-examination. The examination of a witness by the party producing him is called the direct examination; the examination of the same witness, upon the same matter, by the adverse party is called the *cross-examination.* The direct examination must be completed before the cross-examination begins, unless the court otherwise directs. (Sec. 2045, C.C.P.)

Leading Questions. A question which suggests to the witness the answer which the examining party desires, is called a *leading* or *suggestive question.* On a direct examination, leading questions are not allowed, except in the sound discretion of the court, under special circumstances, making it appear that the interests of justice require it. The opposite party may cross-examine the witness as to any facts stated in his direct examination or connected therewith, and in so doing may put leading questions. But if he examines him as to other matters, such examination is to be subject to the same rules as direct examination. (Sec. 2046, C.C.P.)

Hearsay. Evidence not proceeding from the personal knowledge of the witness, but from the mere repetition of what he has heard others say, is called *hearsay evidence.* (*Black's Law Dictionary.* West Publishing Co., St. Paul, Minn.)

Evidence based upon rumor, common talk, or the statement of someone else is hearsay and, with few exceptions, is inadmissible as evidence. In surveying practice the surveyor often bases his opinions upon hearsay facts, such as a monument found and commonly reported by many as being in a correct position. Obviously a surveyor could not be present in person when all of the original surveys were made; hence his opinion of where property lines belong may be based entirely upon hearsay evidence of where the original surveyor set his monuments.

Expert opinions are admissible even though they may be based upon inadmissible hearsay evidence.

Jury. All questions of fact, where the trial is by jury, are to be decided by the jury, and all evidence thereon is to be addressed to them. (Sec. 2101, C.C.P. Cal.)

A jury trial may be requested by either side. If there is a jury trial, the jury decides questions of fact. If a government section corner is lost, and there is a dispute over which of several monuments represents the true corner, the jury would decide which monument represents the true corner. If a fence has been in existence for a period of time and the question arises as to how long the fence has been in existence, the jury would decide. But if there is a question of the legal interpretation of the meaning of a deed term, the judge would decide that.

Not many attorneys care for jury trials in boundary litigations; hence, the judge usually tries both facts and law. In such event most of the testimony as to the facts concerning boundaries are testified to by the surveyor. A surveyor's main duty is to gather facts. He measures distances, angles, and bearings, and searches for monuments. Any fact he observes and measures is a fact to which he may testify.

Lay Witness. Lay witnesses are those that may testify to facts within their knowledge and may not state their opinions.

This is the rule. But there are many, many exceptions to the rule. In fact practically all of the discussion of the rule centers around instances that are exceptions.

Often there is no way of extracting the facts from a lay witness, other than by allowing him to express an opinion on things derived from his own perception. A statement that there was an *old* fence between the two properties is an opinion. *Hot* or *cold* may only be an opinion, especially when a person says *how* hot or cold a thing is. The lay witness testifies about subject matter readily understood by the court. Preventing the lay witness from stating opinions, especially on matters regarding which he is not qualified to do so, tends to prevent fraud and perjury and is one of the strongest safeguards of personal rights.

Expert Witness. Generally a witness may testify as an expert witness if he possesses peculiar knowledge, wisdom, or information regarding the subject matter in consideration, said

knowledge, wisdom, or information being acquired by study, investigation, observation, practice, or experience. But such knowledge is not of the type that is likely to be possessed by ordinary laymen or inexperienced persons. (King vs. King et al, 161 Miss. 51)

Because of training and experience many surveyors are qualified to be declared experts by the court. The word "many" instead of the word "all" was used advisedly. Mere licensing is not proof. An expert is one who can demonstrate real knowledge, experience, and wisdom on the point in question.

Because of his special knowledge, the expert is permitted to testify as to conclusions drawn from facts within his field. The expert gives the result of a process of reasoning which can be mastered only by special training.

Appointment of Expert Witnesses. Either side may call their own expert witness. In some jurisdictions the court may appoint an expert.

"Whenever it shall be made to appear to any court or judge thereof, either before or during the trial of any action or proceeding, civil or criminal, pending before such court, that expert evidence is, or will be required by the court or any party to such action or proceeding, such court or judge may, on motion of any party, or on motion of such court or judge, appoint one or more experts to investigate and testify at the trial of such action or proceeding relative to the matter or matters as to which such expert evidence is, or will be required, and such court or judge may fix the compensation of such expert or experts for such services, if any, as such expert or experts may have rendered, in addition to his or their services as a witness or witnesses, at such amount or amounts as to the court or judge may seem reasonable." (Sec. 1871 C.C.P. Calif.)

The practice of the parties hiring their own expert witnesses has been severely criticized. There is an implication of bias towards the party calling the expert, especially when a sizable fee is involved. A precommitment or preconsultation with a party in itself presents the flavor of bias. A party may interview many experts before he can find one that is favorable to his cause, and thus not present a true picture to the court. It is indeed unfortunate that many are often tarred by the same brush. Such ideas are an injustice to the conscientious expert whose only concern is the truth of the principle involved.

Duties of Expert Witness. A summary of the duties demanded of an expert witness is:

a. All questions put to him should be answered clearly and intelligently.

b. He should be absolutely unbiased and honest.

c. He should have real expert knowledge of his particular subject.

d. He should be prepared to discuss the opinions of other authorities and state why he agrees or disagrees with them.

e. His testimony should be limited to things and opinions that he can defend before experts in his particular field.

The opinions of the expert are generally only arguments in behalf of a litigant. Hence, his testimony is often valuable only because of the reasons and facts given to support his conclusions. Rejection of conclusions unsupported by facts or reasons can be expected.

Testimony that cannot be understood by the judge or jury is practically valueless. A statestatement that "I ran a traverse around the deed and found an error of closure of two feet" is simple to the surveyor but obscure jargon to the average person. It is doubtful if the judge or jury would know that the traverse might be an office calculation and not a field measurement. "Error of closure" certainly needs clarification to most people. A judge became a judge because he was an attorney, not a surveyor. One of the assets of a good expert witness is simple, clear English. Don't try to awe the jury by your ability to "elucidate" by "ostentatious" terminology. Explain by simple terms.

At no time should the surveyor place himself in such a position that he is obligated to take a particular side in his testimony. When the expert is on the stand he should make every effort to rid himself of any bias or prejudice resulting from who is paying the fee or who has previously consulted with him.

No one can expect to remember in detail all of the facts he is to present without refreshing his memory. Surveyors take field notes and develop evidence in writing. Maps are examined and deeds are read. Prior to taking the stand the surveyor should refamiliarize himself of all the data, otherwise embarrassment may result from a searching cross-examination. He should be especially prepared to explain the error of the contrary opinion.

Opinion Evidence. As previously stated, the lay witness is limited to testimony concerning facts and may sometimes give opinions on things that are easy for everyone to understand. The expert may give opinions on subjects that are beyond the knowledge of average people. But such right to give opinions is not unlimited.

No witness can give opinions on the *ultimate fact* that is being tried. Permitting an expert

to tell the jury what they must decide is usurping their exclusive rights. If the north quarter corner location is in dispute and any one of three stone mounds might be the right one, the surveyor cannot tell the judge or jury which one they should select. He can walk all around the subject and even answer hypothetical questions that almost give direct answers on the solution. He could describe in detail the shape and size of the mounds and describe any special markings found. If leaves were found under one of the mounds, indicating recent construction, such a fact could be emphasized. What was found in other similar locations and whether the original surveyor consistently set a certain type of monument could be discussed. Needless to say, the examining attorney would have to be well versed on the facts observed by the surveyor, otherwise he would not know which questions to ask. The surveyor is more or less limited in his response to the questions asked.

No witness may give his opinion on the questions of law presented. Whether a deed was properly executed or how a deed word should be interpreted are questions of law for the court to decide. The court and attorneys are experts at law, not the surveyors.

No expert opinions may be given to the jury if they are capable of forming their own opinion. The purpose of giving expert opinions is to advise the jury on matters beyond their knowledge, not on matters within their knowledge.

Fortunately the expert witness does not have to decide when he can or cannot give opinions. The judge will tell him. A question is presented to him, and if the other side objects, the judge will rule on whether the question can be answered.

Hypothetical Questions. A hypothetical question is a question put to an expert witness containing a recital of facts assumed to have been proved or proof of which is offered in the case and requiring the opinion of expert witness thereon.

Hypothetical implies "assumed without proof." Each side thinks or hopes that they can prove certain facts to be true. But neither side can be certain of what the jury will declare to be true. So a hypothetical question such as, "Assuming that this, this, and this are true, could you express an opinion as to whether a person so injured could continue doing surveying work?", is asked. The facts assumed to be true are the facts presented or to be presented in the case. If the jury finds that the facts are not as assumed, the opinion of the expert is without effect. Several hypothetical questions may be asked by adding extra assumed facts or subtracting assumptions.

Hypothetical questions are more frequently used for doctors in personal injury cases. Rarely the surveyor will find such questions presented to him.

Cause and Effect. An expert may testify as to what might have caused a thing; but it is better not to say what did cause it. Thus, a surveyor might testify that the improper location of a fence might be caused by measuring from an incorrect monument located five feet from the correct monument. He should not say that it was the cause; that is for the jury to decide. To say that a $2'' \times 2''$ pine stake located at the property corner would completely disappear in 30 years, due to decomposition, termites, etc., would be improper. To say that at all locations where pine stakes were originally set none were found that were over 30 years old, and those older than 10 years were in a bad state of decomposition, would be proper.

Textbooks. Because the author of a book cannot be cross-examined and the author did not write his book under oath, books are, by common law, excluded as evidence.

In most States, by statute law, the right to use books of science or art and published maps or charts is permitted under limited conditions. In California section 1936 of the Code of Civil Procedure makes "historical works, books of science or art, and published maps or charts, when made by persons indifferent between the parties, . . . prima facie evidence of facts of general notoriety and interest".

From Gallagher vs Market St. Ry. Co., (67 Cal. 13) is extracted, "Evidence of this sort is confined in a great measure to ancient facts which do not presuppose better evidence in existence. . . . The work of a living author, who is within the reach of the process of the court, can hardly be deemed of this nature. Such evidence is only admissible to prove facts of a general and public nature, and not those which concern individual or mere local communities. Such facts include the meaning of words which may be proved by ordinary dictionaries and authenticated books of general literary history, and facts in the exact sciences founded upon conclusions reached from certain and constant data by processes too intricate to be elucidated by witnesses when on examination. Thus, mortality tables for estimating the probable duration of the life of a party at a given age; chronological tables; tables of weights, measures and currency; annuity tables; interest tables and the

like, are admissible to prove facts of general notoriety and interest in connection with such subject as may be involved in the trial of a cause."

The expert's memory may be refreshed by referring to standard works of his profession, but the books may not be read to the court. The witness may state the reasons for his opinion, even though the reasons were founded on books, as a part of his general knowledge. If a witness bases his opinion upon a book and says so, extracts from the book may be read to contradict him. But if an expert has testified from his own experience, books may not be received in evidence to show that the authors of books disagree with the opinion of the expert.

Power to Compel Expert to Testify. (2 ALR 1576 annotated, The Lawyers Co-operative Publishing Company, Rochester, N. Y.) The right of an expert to refuse to testify as to matters of opinion, without compensation, is traced back to English common law. In Webb vs Page (1843) 1 Car. & K (Eng) 23, the right of the expert to demand compensation prior to testifying was upheld.

For the usual witness fee a lay or expert witness is required to testify to facts seen or observed by him. If a surveyor observes certain facts or sets certain monuments, he may be compelled to testify as to these facts. But where a party selects an expert to render an opinion on a peculiar subject, the expert can refuse until satisfactory arrangements are made for compensation.

Many jurisdictions hold that an expert must testify to facts within his knowledge even though special study, learning, or skill were required to determine them. In Fonda vs Bolton (1883) 6 NJLR 240, a civil engineer was denied the right to recover compensation for services as an expert witness. He was called as an expert by the party who employed him to make a survey. Since he attended court under a subpoena, he was bound to testify as to what he knew, however he acquired the knowledge. In Summers vs State (5 Tex. App. 365) a medical expert was compelled to report on the findings of a post mortem examination without extra compensation.

But there is nothing in the law that compels an expert witness to make a free preliminary investigation to prepare himself for expressing an opinion. A surveyor who is asked to perform certain surveys as a preparation for litigation, cannot be compelled to do so without compensation. If a deed is presented to a surveyor in court, and he is asked where it is located on the ground, the surveyor may refuse to read the document and give an opinion. But if he has already read the document and has already formed an opinion, he probably would be bound to express his opinion.

In United States vs Cooper, 21 D.C. 491, the court observed that it was an obligation of an expert to serve upon payment of a reasonable fee.

In summary, in many jurisdictions surveyors are bound to testify to the results of surveys performed in the past. They are not bound, without compensation, to express opinions on things that require professional preparation prior to expressing the opinion.

It is interesting to note that an expert witness may not refuse to answer a question on the grounds that it will cause him civil liability. Usually the only grounds for refusal to answer a question is that the answer may cause the witness to self-incriminate himself for a crime. Refusal to answer a question because it may cause embarrassment, disgrace, or monetary loss from civil liability, is not an excuse. The privilege of refusal to answer a question applies only to crimes. (CJS Vol 98 p98).

Expert Witness Fees. The surveyor's fee for expert testimony is a contractual arrangement between the surveyor and the party engaging him.

The courts cannot compel a person to perform work. If a measurement or observation is required, the right of a litigant to hire an expert is recognized. Before commencing the work, the surveyor should have a clear understanding of what his fee will be. If the work is performed, and there is no understanding as to the amount of the fee, the surveyor may be compelled to testify as to what he knows without the benefit of a fee. It is advisable to include within the fee all expenses that will be incurred in court appearances, since a person is compelled to appear in court whether he receives a fee or not. The only collectable part of the contract is the work for preparation to appear in court.

The rule is that a so-called expert witness is not entitled to extra compensation for any testimony which he may be required to give under an ordinary subpoena of the court. (16 AIR 1462.)

The compensation of an expert witness cannot be dependent upon the outcome of the litigation, since it furnishes a powerful motive for exaggeration, misrepresentation, or suppression.

"We are aware that witnesses who are to be called to give expert testimony which involves

the special knowledge and skill of the witnesses, and often requires examination and study upon a particular branch or science, are, from the necessities of the case, justified in demanding and receiving compensation for their time and labor devoted to the investigation of the particular science about which they are to testify; but this practice has been allowed from the necessities of the case, and the inability of courts and juries to determine questions without the benefit of such expert knowledge. Such agreements, however, can never be valid where the amount to be paid is to depend upon the testimony that is to be given, and where the right of compensation depends upon the result of the litigation". (Re Schapiro, 144 App. Div. 1, 128 NY Supp 852.)

Amount of Expert Witness Fee Is Subject to Cross-examination. Cross-examination may extract from an expert the fact that he is to receive a fee and how much the fee is.

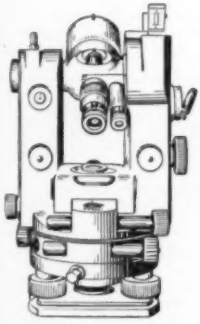
"The amount of an expert's fees, whether stipulated in advance of a trial or determinable in the future, has a direct and vital bearing upon his credibility, interest, bias, or partisanship, and the rule permitting cross-examination with reference thereto should be liberally applied". (33 ALR 2nd 1167, annotation 33 ALR 2nd 1170.)

"An engineer who testified for the petitioner may be asked on cross-examination, if he had not been promised "considerable money" if the preceding went through, as it is always competent to ask a witness, on cross-examination, by whom he is employed and whether he is paid, in order to show his interest". (West Skokie Drainage District vs Dawson, 243 Ill. 175.)

In a park condemnation proceeding, it was error not to allow a question asked of a real estate agent, who had estimated values for the city, as to whether he was interested in the sale of land that would be benefited by the park. (Oakland vs Adams, 37 Cal. App. 614.)

Survey Must Be Done by Surveyor. The surveyor who testifies in a case must be the one who who made the survey. In the case of Hermance vs Blackburn (206 CA 653) the court notes ". . . it was error to permit a witness to testify that a certain arch protruded over the lot line where said witness testified that the survey was not made by him personally, but by men in his employ".

₹ ₹ ₹



Backed by almost two centuries of experience and devoted study the

BREITHAUPT OPTICAL DOUBLE CENTER THEODOLITE NO. I "TEINS"

provides accuracy and dependable performance. Fast direct reading of both circles to 1 minute, safe estimation to 6 seconds. Optical plummet for greater reliability and speed. Body detachable from the levelling head for use with the "three tripod system" of observing.

Write for literature to

F. W. BREITHAUPT & SOHN
ADOLFSTRASSE 13, KASSEL/WESTERN GERMANY
LAND AND MINE SURVEYING INSTRUMENTS • FOUNDED IN 1762
or to
LOS ANGELES SCIENTIFIC INSTRUMENT CO.
2451 Riverside Drive, Los Angeles 39, Calif.
(Representative for the western states of the U.S.A.)

BREITHAUPT KASSEL

A progress report—

Glen Canyon Dam Project to open vast new area

Work on huge Upper Colorado River Project well under way

When completed some six years hence, the giant Glen Canyon Dam, Reservoir and Powerplant Project will unlock the riches of a vast, 10,000-square-mile area.

The high concrete gravity arch dam, rising 700 feet from bedrock, will contain 5,493,000 cubic yards of concrete. Power from the 900,000 KW power plant, located 470' downstream from the dam, will make possible the development of huge resources of fuel, oil, minerals—including uranium—and timber.

When filled to capacity the 28,000,000-acre-foot reservoir will stretch 186 miles up the Colorado and 71 miles up the San Juan, a major tributary of the Colorado. Basically, this project is for river control and power generation.

Largest single dam contract on record

The $107,155,222 contract for the Glen Canyon Dam and Powerplant, largest ever awarded by the U.S. Bureau of Reclamation, went to Merritt-Chapman & Scott Corporation, New York. On April 29, 1957, the day the contract was awarded, Merritt-Chapman & Scott signed a contract with Fairchild for aerial mapping of the dam site, reservoir and areas adjacent to the dam site. Flying operations began on May 5, *just six days later!* Advance copies of the flying results were delivered on May 26. Other detailed data followed soon after.

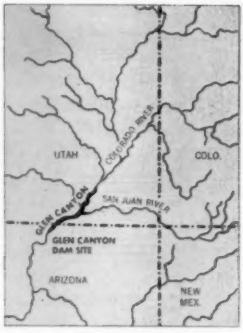
Scale of maps for Glen Canyon

Reservoir: 1" equals 400', 10' contours

Dam site: 1" equals 50', 2' contours

Areas adjacent to dam site: 1" equals 200', 5' contours

During the past 34 years, Fairchild crews have flown similar mapping assignments all over the free world. Results produced from this experience have led thousands of Fairchild clients to say... if you want it done *fast* and *right the first time*, you can depend on Fairchild.



Site of the 700' Glen Canyon Dam, second in height only to Hoover Dam (726') is located 12 miles downstream from the Arizona-Utah border—370 miles upstream from Hoover Dam.

Walls of the canyon at the dam site are 650' high with overhang in places. This necessitated flight paths parallel to the walls but offset to see under the overhangs.

FAIRCHILD AERIAL SURVEYS, INC.

Los Angeles, California: 224 East Eleventh Street • **New York, New York:** 30 Rockefeller Plaza • **Chicago, Illinois:** 111 West Washington • **Long Island City, New York:** 21-21 Forty-First Avenue • **Tallahassee, Florida:** 1514 South Monroe Street • **Boston, Massachusetts:** New England Survey Service, 255 Atlantic Avenue • **Shelton, Washington:** Box 274, Route 1 • **Houston, Texas:** 3325 Las Palmas • **Birmingham, Alabama:** 2229 First Ave. North

Books in Review

NATIONAL ATLAS OF INDIA (Preliminary Hindi Edition). S. P. Chatterjee, Editor. Ministry of Education and Scientific Research, Government of India, Calcutta and Dehra Dun, 1957.

The publication of the first *National Atlas of India* provides an up-to-date cartographic representation of India's physical background and socio-economic structure. Professor S. P. Chatterjee of Calcutta University, who directs the National Atlas Organization, has prepared this series of handsome plates, each measuring 26 by 30 inches. Credit for the excellence of the maps is due also to the long experience and high standards of cartography in the Survey of India Offices, which undertook the final drafting and printing. The use of Hindi in titles, legends, and notes is not a great barrier to non-Indian readers for English translations are included.

The *Atlas* contains 26 sheets (see Table of Contents), comprising 21 maps of India on a scale of 1:5,000,000 (1 inch = 79 miles), and 16 maps on a scale of 1:10,000,000, as well as smaller-scale world maps and a large number of insets. All maps are printed in colors, except four geological maps to accompany Map No. 8 and reference map of India in English, included with the explanatory notes. The Administrative Map (No. 2), the first comprehensive delineation of India's minor civil divisions published since the 1881 census, shows the boundaries of all *tehsils, taluks,* and *thanas* within the states, as reorganized November 1, 1956, and is accompanied by a list of names both in Hindi and English. In most of the maps one type of feature has been indicated by color tints and another by color screens or other symbols. For example, in the Forest and Land Use Map (No. 11), twelve color tints indicate categories of used land or waste, while various overprinted screen and point symbols designate 35 dominant tree species and 11 major vegetation types.

National Atlas of India (Preliminary Hindi Edition, 1957). (Scale is 1:5,000,000 unless otherwise specified.)

Table of Contents

Map No.	Title	Scale
1	India and the World	1:60,000,000
2	Administrative	
3	Relief Bathymetric and Hypsometric)	
4	Physiography	
5	Drainage	
6	Rainfall (Normal Annual)	
7	Temperature and Winds (4maps)	1:10,000,000
8	Geolithology (with four special maps at 1:4,000,000)	
10	Soils	
11	Forests and Land Use	
12	Irrigation	
13	Food Crops	
14	Cash Crops (4 maps)	1:10,000,000
15	Livestock (4 maps)	1:10,000,000
16	Electric Power	
17	Industries	
18	Village and Small Industries	
19	Railways	
20	Transport (4 maps)	1:10,000,000
21	Rural Population	
22	Urban Population	
23	Tribal Population (1931)	
24	Education and Scientific Research	
25	Health	
26	Archaeology and Tourism	

The cost of the Atlas is Rs. 125/— (about $26.40), or in the popular edition Rs. 100/— (about $21.15), exclusive of packing and shipping charges, from the Survey of India Publication Office, Dehra Dun, India. Inquiries from American readers should be directed to Dr. John E. Brush, Department of Geography, Rutgers—The State University, New Brunswick, N. J.

JOHN E. BRUSH

Rutgers University

PROCEEDINGS OF CONFERENCES ON LAND SURVEYING. Compiled and edited by Ken S. Curtis. Engineering Bulletin, Purdue Engineering Extension Department, January, 1958, Series No. 93, 128 pages, illustrated. $1.00.

This paper covered bulletin, with a page size of 6 by 9 inches, includes papers given at the various conferences on land surveying which were held at Purdue University, in January of each year from 1953 to 1957, inc., under the joint sponsorship of the School of Civil Engineering and the Division of Adult Education

of Purdue University and the Indiana Society of Professional Land Surveyors.

Probably the best idea of the contents of this bulletin can be given by reproducing the list of papers from the table of contents. They are:

The Qualifications of a Land Surveyor, by Arthur D. Kidder, Consulting Cadastral Engineer, Terra Haute, Indiana

History of Early Land Surveys in Indiana, by Charles E. Condra, Floyd County Surveyor, New Albany, Indiana

Perpetuation of Section Corners, by Frank E. Ester, Engineer of Road Location, Indiana State Highway Department, Indianapolis, Indiana

Technical Standards for Property Surveys, by Ralph M. Berry, Professor of Surveying, University of Michigan, Ann Arbor, Michigan

A Young Man Looks at the Land Surveying Profession, by James E. Dankert, Civil Engineer and Land Surveyor, Paul I. Cripe, Inc., Indianapolis, Indiana

Writing Metes and Bounds Descriptions, by Lloyd H. Kemmer, Assistant Professor of Civil Engineering, Purdue University

Land Surveyor's Liability, by Gene Richey, Attorney, Lafayette, Indiana

Astronomical Observations for True Meridian, by Lloyd H. Kemmer, Assistant Professor of Civil Engineering, Purdue University

Legal Position of the County Surveyor in Indiana, by Paul M. Kelly, Attorney, Lafayette, Indiana

The Indiana Coordinate System, by Carl A. Egner, Associate Professor of Surveying (retired), Commander, USC&GS (retired), Lafayette, Indiana

Indiana's New Mapping Program, by Charles E. Bechert, Director, Division of Water Resources, Indiana Department of Conservation, Indianapolis, Indiana

Information Bulletin for Candidates for Registration as Land Surveyor

Constitution of Indiana Society of Professional Land Surveyors

"An Old Surveyor's Thoughts" (verse) by Charles E. Condra, Floyd County Surveyor, New Albany, Indiana

Bibliography on Land Surveying, Compiled by Ken S. Curtis, Assistant Professor of Surveying and Mapping, Purdue University

The final item, the bibliography, includes a total of 204 references, grouped under the following subheadings:

General
Legal Aspects and Descriptions
Instrumentation, Computation, and Techniques
Accuracy Standards
Governmental Cadastral Surveys
Use of Control and Coordinate Systems
Education and Training
Historical
Special Geographical Interest

This bibliography alone should be well worth the price of the publication to anyone seriously interested in the land surveying profession.

HOWARD S. RAPPLEYE

PROCEEDINGS OF THE FIRST SURVEYING AND MAPPING CONFERENCE. Compiled and edited by Clifford G. Bryner. Bulletin of the University of Utah, Vol. 48, No. 13, June 1957. Also listed as Bulletin No. 85 of the Utah Engineering Experiment Station, Department of Civil Engineering. vi + 98 pages.

This processed, paper-covered, publication, with a page size approximately 8½ by 11 inches, edited by the director of the conference, reproduces the papers presented at the formal sessions of the First Surveying and Mapping Conference sponsored jointly by the Utah Chapter of the American Public Works Association and the Civil Engineering Department of the University of Utah. Apparently the dates of the conference have not been recorded in this bulletin.

Eight papers are included, as follows:

Professional Status of Persons Engaged in Surveying and Mapping. A. O. Quinn, Member of A.S.C.E. Task Committee and Chief Engineer, Aero Service Corporation.

Consistent Effort in Surveying Measurements. Clifford G. Bryner, Civil Engineering Department, University of Utah.

Recent Developments and Capabilities of Photogrammetry in Answering the Needs for Up-to-Date Maps. E. E. Dando, Aero Service Corporation, San Francisco, California.

Photogrammetry—Its Practical Application and Limitations in Highway Planning, Location and Design. D. E. Winsor, Photogrammetric Engineer, Division Nine, Bureau of Public Roads, Denver, Colorado.

Application of Electronic Computers to Surveying Calculations. V. A. Van Praag, Bendix Computer, Los Angeles, California.

Altimetry in Topographic Mapping. J. M. Lawson, Rocky Mountain Region Engineer, U. S. Geological Survey, Denver, Colorado.

European Surveying Instruments. Kendall B. Wood, President, K. B. Wood & Associates, Inc., Portland, Oregon.

Function of the Cadastral Engineer of the Bureau of Land Management in Connection with the Disposition of Public Lands. F. Wayne Forrest, Assistant Area Cadastral Engineer, Bureau of Land Management, Salt Lake City, Utah.

The last two pages of the publication list the names of the 122 registered attendants at the conference.

HOWARD S. RAPPLEYE

Mackinac Bridge

The ceremonies in connection with the dedication of the Mackinac Bridge, connecting the upper and lower peninsulas of Michigan, must have been rather elaborate.

A release from the Post Office Department tells of the ceremonies involved with the issuance of the Mackinac Bridge commemorative stamp at Mackinaw City and St. Ignace on June 25th.

A short item in *Civil Engineering,* July 1958, p. 95, states that the actual dedication of the bridge to public use occurred on June 28th.

The *Journal of the Surveying and Mapping Division,* Proceedings of the American Society of Civil Engineers, Vol. 84, No. SU2, July 1958, includes, on pages 1716–1 to 1716–8, inc., an illustrated paper, "Precise Surveys for Mackinac Bridge" by R. M. Boynton, Associate Engineer, D. B. Steinman, Consulting Engineer, New York, N. Y.

This paper describes in considerable detail the reconnaissance surveys, the major and minor triangulation nets, the methods used for locating piers, vertical control, methods of communication, and special surveying equipment required for properly integrating the various parts of this gigantic structure.

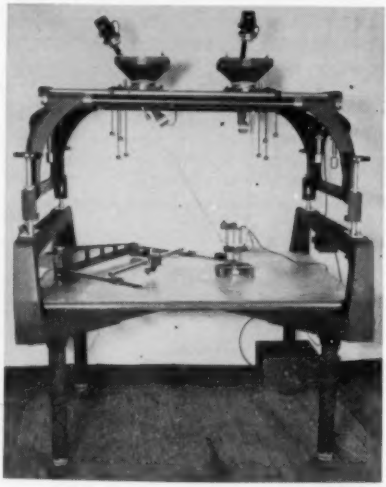
Monuments Make Good Intersection Points

In 1888 a ten-foot, granite monument was erected, on a low hill overlooking the Thompson River in southern Iowa, to commemorate the struggling Mormons who died and were buried there in 1846–48. Recently the monument was "located" by a field party of the Coast and Geodetic Survey and designated as an "intersection station."

The survey has changed nothing at the monument which is still visited by followers from throughout the country. There are no marks left behind to show that the Survey has been there. The only evidence of the visit is an entry in a field book and a small white card, identical to thousands of others for similar points throughout the 48 states.

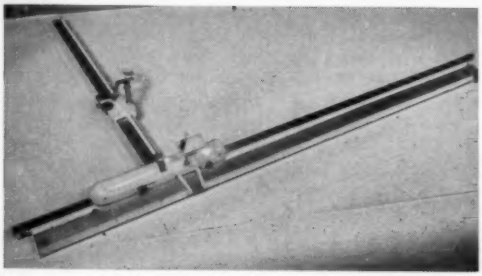
This monument is not the first such point to be "located." In 1943, a party located another Mormon monument near Palmyra, New York. A 25-foot marble shaft topped by the majestic figure of Angel Moroni stands on a hill which is the Mormon equivalent of Mount Sinai.

The Washington Monument in Washington, D.C., was "located' in 1892 from two triangulation stations more than 45 miles away. One was BULL RUN in northern Virginia, near Middleburg, and the other was SUGAR LOAF in Maryland, near Harpers Ferry. In November 1934, instruments were actually placed, for the first time, on top of the 555-foot Washington monument and observations made on several prominent points, including the United States Capitol building.



THE ONLY FULL SCALE
PRECISION PLOTTER
AT A POPULAR PRICE

A LOW PRICED,
PORTABLE PRECISION
COORDINATOGRAPH



AN AUTOMATIC
DODGING PRINTER,
WITHOUT ELECTRONIC
COMPLICATIONS
AND COST

THREE PRODUCTS

Recommended by
THE KELSH INSTRUMENT CO., INC.
1031 E. BALTIMORE ST.
Baltimore 2, Md., U.S.A.

Tel. Broadway 6-6924

Cable address KELSHCO

MAP INFORMATION

This department was inaugurated for the purpose of bringing to the attention of the members information pertaining to the availability of maps, surveys, etc., with particular emphasis on how such material can be procured. It is believed that through an interchange and dissemination of such information maximum benefits will accrue to the surveying and mapping profession. —EDITOR

Topographic Maps

THE FOLLOWING quadrangle maps were published or became available for distribution by the U.S. Geological Survey between March 1 and May 31, 1958. The list includes newly compiled maps; revised maps on which contours and drainage usually are unchanged but the works of man are brought up to date; and series-converted maps which are 15-minute maps produced from four 7½-minute maps of the same area. The maps are new unless otherwise designated by numerical superscript.

The quadrangle name (in capital letters) is followed by the name of the county (in upper- and lower-case letters) that contains the place or feature for which the quadrangle is named.

All maps are available with or without the green overprint that indicates woodland. These maps show the shape and elevation of the land surface (represented by contour lines, printed in brown); water features (in blue); works of man, including cities, towns, and scattered habitations, schools, churches, railroads, roads and boundaries, place and feature names (in black); and woodland areas (in green). Principal roads are shown by a red overprint. In areas that have been covered by Bureau of Land Management surveys, township and section lines are shown. The State rectangular coordinate and the UTM 1,000-meter grid systems are indicated in the margins of the maps. An information folder further describing topographic maps is available on request.

Standard quadrangle maps may be obtained for 30 cents per copy. A discount of 20 percent is allowed on orders amounting to $10 or more at the retail price; a discount of 40 percent is allowed on orders amounting to $60 or more. Orders should be addressed to the U. S. Geological Survey, Washington 25, D. C., (or Denver 15, Colo., for maps of areas west of the Mississippi River).

* Indicates 15-minute quadrangles; all others are 7½-minute quadrangles.
[1] Indicates a revised map.
[2] Indicates a series-converted map.
† Indicates availability in either a contour or a shaded-relief edition.
‡ Indicates preliminary black and white edition.

Alabama

AUTAUGAVILLE*—Autauga
BENTON*—Lowndes
BRAGGS*—Lowndes
CARLOWVILLE*—Dallas
LETOHATCHEE*—Lowndes

Alabama-Mississippi

MARGERUM—Colbert

Alaska

BIG DELTA (A-2)*—Fourth Judicial Division
DILLINGHAM (A-2)*—Third Judicial Division
DILLINGHAM (A-4)*—Third Judicial Division
DILLINGHAM (A-5)*—Third Judicial Division
CRAIG (A-3)*—First Judicial Division
CRAIG (D-7) & (D-8)*—First Judicial Division
FORT YUKON (D-2)*—Fourth Judicial Division
FORT YUKON (D-3)*—Fourth Judicial Division
FORT YUKON (D-4)*—Fourth Judicial Division
HEALY (D-6)*—Fourth Judicial Division
HUGHES (A-1)*—Fourth Judicial Division
HUGHES (A-2)*—Fourth Judicial Division
HUGHES (A-3)*—Fourth Judicial Division
KATEEL RIVER (A-5)*—Fourth Judicial Division
KATEEL RIVER (B-1)*—Fourth Judicial Division
KATEEL RIVER (B-4)*—Fourth Judicial Division
McCARTHY (A-8)*—Third Judicial Division
MELOZITNA (D-1)*—Fourth Judicial Division
MELOZITNA (D-3)*—Fourth Judicial Division
MT. HAYES (B-1)*—Fourth Judicial Division
MT. HAYES (C-1)*—Fourth Judicial Division
MT. HAYES (D-1)*—Fourth Judicial Division
MT. HAYES (D-3)*—Fourth Judicial Division
MT. McKINLEY (C-1)*—Fourth Judicial Division

NABESNA (C-1)*—Fourth Judicial Division
NABESNA (D-1)*—Fourth Judicial Division
NABESNA (D-2)*—Fourth Judicial Division
NAKNEK (B-2)*—Third Judicial Division
NAKNEK (B-3)*—Third Judicial Division
NAKNEK (B-4)*—Third Judicial Division
NAKNEK (B-5)*—Third Judicial Division
NAKNEK (C-5)*—Third Judicial Division
NAKNEK (C-6)*—Third Judicial Division
NAKNEK (D-2)*—Third Judicial Division
NOATAK (A-3)*—Second Judicial Division
NOATAK (D-7)*—Second Judicial Division
NORTON BAY (A-3)*—Second Judicial Division
NORTON BAY (A-4)*—Second Judicial Division
NORTON BAY (B-5)*—Second Judicial Division
NORTON BAY (C-1)*—Second Judicial Division
NORTON BAY (C-3)*—Second Judicial Division
NORTON BAY (C-4)*—Second Judicial Division
NORTON BAY (C-5)*—Second Judicial Division
NORTON BAY (D-4)*—Second Judicial Division
NULATO (C-5)*—Fourth Judicial Division
NUSHAGAK BAY (C-1)*—Third Judicial Division
PETERSBURG (C-5)*—First Judicial Division
PETERSBURG (C-6)*—First Judicial Division
PETERSBURG (D-5)*—First Judicial Division
POINT HOPE (A-2)*—Second Judicial Division
PORT ALEXANDER (A-2)*—First Judicial Division
TANACROSS (A-2)*—Fourth Judicial Division
TANACROSS (C-6)*—Fourth Judicial Division
UNALAKLEET (D-3)*—Second Judicial Division
UNALAKLEET (D-4)*—Second Judicial Division

Arizona

AVONDALE SW—Maricopa
BELLOTA RANCH*—Pima
GLENDALE—Maricopa
HEDGPETH HILLS—Maricopa
McMICKEN DAM—Maricopa
‡RED BUTTE SE—Coconino
RINCON VALLEY*—Pima
‡SONSALA BUTTE 3 NE—Apache
‡SONSALA BUTTE 3 NW—Apache
‡SONSALA BUTTE 3 SE—Apache
‡SONSALA BUTTE 3 SW—Apache
TWIN BUTTES*[1]—Pima
VALENCIA—Maricopa

Arkansas

DECKERVILLE*—Poinsett

California

ALAMORIO NE—Imperial
ALPINE BUTTE—Los Angeles
ANTELOPE MTN.*—Lassen
BAGDAD*—Lassen
BANNOCK*—San Bernardino
BRISTOL LAKE*—San Bernardino
CADIZ LAKE*—San Bernardino
CADIZ VALLEY*—San Bernardino
CARRIZO MTN.—Imperial
COLTON WELL*—San Bernardino
FENNER*—San Bernardino
FIREBAUGH—Fresno
GIANT FOREST*—Tulare
GLENNVILLE—Kern
HI VISTA—Los Angeles
HOLTVILLE EAST—Imperial
HOLTVILLE WEST—Imperial
KAWEAH*—Tulare
KRAMER*[1]—San Bernardino
LEVIS—Fresno
LITTLEROCK—Los Angeles
MILLIGAN*—San Bernardino
MT. CARMEL—Monterey
NEW IDRIA*[1]—San Benito
PAINTED GORGE—Imperial
PALO ESCRITO PEAK—Monterey
PANOCHE VALLEY*—San Benito
PARAISO SPRINGS—Monterey
PLASTER CITY NW—Imperial
RANA CREEK—Monterey
STEPLADDER MTS.*—San Bernardino
SYCAMORE FLAT—Monterey
VALLEY MTN.*—San Bernardino
VICTORVILLE*[2]—San Bernardino
YUHA BASIN—Imperial

California-Nevada

HOMER MTN.*—San Bernardino

California-Oregon

HAPPY CAMP*—Siskiyou
PRESTON PEAK*—Siskiyou

Colorado

ARVADA[1]—Jefferson
BOX ELDER SCHOOL[1]—Adams
BRIGHTON[1]—Adams
BYERS—Arapahoe
COAL CREEK[1]—Arapahoe
EVERGREEN—Jefferson
INDIAN HILLS—Jefferson
LOUISVILLE[1]—Boulder
MILE HIGH LAKES[1]—Adams
MORRISON—Jefferson
PARKER[1]—Douglas
SABLE—Adams

Connecticut

CORNWALL[1]—Litchfield
ELLSWORTH[1] (1 : 31,680)—Litchfield
SOUTH CANAAN[1]—Litchfield
SOUTH CANAAN[1] (1 : 31,680)—Litchfield

Florida

FORT WALTON BEACH*[1]—Okaloosa
HOLT*[1]—Okaloosa
NICEVILLE*[1]—Okaloosa
TUCKERS CORNER—Charlotte
VENUS SW—Highlands
VILLA TASSO*[1]—Walton

Florida-Georgia

OCTAHATCHEE—Hamilton

Georgia

DOERUN*—Colquitt
LESLIE*—Sumter
MACON EAST—Bibb

Georgia-Florida

MICCOSUKEE NE—Leon

Idaho

BLUE BUTTE*—Owyhee
BOISE*—Ada
WINTER CAMP*—Owyhee

Illinois

BONDVILLE—Champaign
ELIZA—Mercer
HIGHLAND—Madison
MAHOMET*—Champaign
RISING—Champaign
TRENTON—Clinton
URBANA—Champaign
URBANA*—Campaign
VENEDY—Washington

Illinois-Iowa

BLANCHARD ISLAND—Rock Island

Indiana

ALBION—Noble
BENNINGTON—Switzerland
BLOOMINGTON—Monroe
CANAAN—Jefferson
CEDARVILLE—Allen
CUZCO—Dubois
FORT WAYNE EAST—Allen
HUNTINGTON—Huntington
MODESTO—Monroe
MONTGOMERY[1]—Daviess
PAOLI—Orange
STANFORD—Monroe
TASWELL—Crawford

Iowa

BENNETT—Cedar
DES MOINES NE—Polk
DES MOINES NW—Polk
DES MOINES SE—Polk
DES MOINES SW—Polk
DURANT—Cedar
FARSON—Wapello
LIME CITY—Cedar
LOWDEN—Cedar
MALVERN—Mills
McCLELLAND—Pottawattamie
OTTUMWA NORTH—Wapello
OTTUMWA NORTH*—Wapello
SHERRILL—Dubuque
TIPTON EAST—Cedar
TREYNOR—Dubuque
UNDERWOOD—Pottawattamie
WILTON JUNCTION—Muscatine

Iowa-Illinois

ILLINOIS CITY—Rock Island
MUSCATINE—Muscatine
TOOLESBORO*—Louisa

Iowa-Wisconsin-Illinois

DUBUQUE NORTH—Dubuque

Kansas

BALDWIN CITY—Douglas
EDGERTON—Johnson
LENEXA[1]—Johnson
LONE STAR—Douglas
OTTAWA SOUTH—Franklin
SHAWNEE[1]—Johnson

Kentucky

FANCY FARM*[2]—Graves

Louisiana

ALEXANDRIA*—Rapides
LECOMPTE*—Rapides

Louisiana-Mississippi

RIGOLETS*[1]—Orleans

Louisiana-Texas

TEXAS POINT[1]—Jefferson
WEST OF JOHNSONS BAYOU[1]—Cameron

Maine

BIDDEFORD POOL[1]—York
GRAND LAKE SEBOEIS*—Penobscot
KENNEBUNKPORT[1]—York
LEWISTON*—Androscoggin
MILLINOCKET LAKE*—Piscataquis
NORTH EAST CARRY*—Piscataquis
POLAND*—Androscoggin
PORTLAND WEST[1]—Cumberland
RAGGED LAKE*—Piscataquis
SEBOOMOOK LAKE*—Somerset
WELLS[1]—York

Maryland
LA PLATA[1]—Charles

Massachusetts
BOSTON SOUTH[1]—Suffolk
NEWTON[1]—Suffolk
SANDWICH[1]—Barnstable

Michigan
ALBA*—Antrim
ECKERMAN*[2]—Chippewa
MATCHWOOD*—Ontonagon
MATCHWOOD NW[1]—Ontonagon
MESICK*—Wexford
ONEKAMA*—Manistee
THOMPSONVILLE*—Benzie

Minnesota
ATWATER*—Kandiyohi
COTTON—St. Louis
FINLAND—Lake
FINLAND*[2]—Lake
ILLGEN CITY—Lake
KARLSTAD*—Kittson
LITTLE MARAIS—Lake
LOST LAKE—St. Louis
SIOUX PINE ISLAND—St. Louis
SPLIT ROCK POINT—Lake
SPLIT ROCK POINT NE—Lake
TOWER—St. Louis
VERMILLION DAM—St. Louis
WHITEFACE—St. Louis

Mississippi
LEXINGTON*—Holmes

Missouri
BIG PINEY*—Pulaski
CABOOL*—Texas
CEDARGROVE*[2]—Shannon
DRYNOB*—Laclede
EDGAR SPRINGS*—Phelps
INDEPENDENCE[1]—Jackson
LEES SUMMIT[1]—Jackson
MOUNTAIN GROVE*[2]—Wright
RICHLAND*—Pulaski
RAYMONDVILLE*[2]—Texas
ROLLA*[2]—Phelps
WAYNESVILLE*—Pulaski
WOODS CHAPEL[1]—Jackson

Missouri-Kansas
GRANDVIEW[1]—Jackson
KANSAS CITY[1]—Jackson

Montana
BEEHIVE—Stillwater
BINNINGS WEST[1]—Yellowstone
COONEY RESERVOIR—Carbon
CROWN BUTTE*—Gallatin
LINDEMULDER HILL—Stillwater
RIMROCK—Yellowstone
TWO PINE SCHOOL—Yellowstone
WHEAT BASIN SW—Stillwater
YEGEN—Yellowstone

Nebraska-Iowa
OMAHA NORTH—Douglas
OMAHA SOUTH—Douglas

Nevada
CACTUS PEAK*—Nye
KAWICH PEAK*—Nye
MUD LAKE*—Nye
REVEILLE PEAK*—Nye
STINKING SPRING*—Nye
TUSCARORA*—Elko

New Hampshire
DOVER WEST[1]—Strafford
MANCHESTER*—Hillsboro
MILFORD*—Hillsboro

New Hampshire-Maine
PORTSMOUTH[1]—Rockingham

New Jersey
HACKENSACK[1]—Bergen
ORANGE[1]—Essex
PORT NORRIS—Cumberland

New Jersey-New York
PARK RIDGE[1]—Bergen
WEEHAWKEN[1]—Hudson

New Jersey-Pennsylvania
EASTON[1]—Northampton

New Mexico
FRIJOLES*[2]—Sandoval
SAN FELIPE PUEBLO*[2]—Sandoval
SANTO DOMINGO PUEBLO*[2]—Sandoval

New York
BIG MOOSE*—Herkimer
CANDOR—Tioga
EDWARDS—St. Lawrence
GARDINER[1]—Ulster
GOUVERNEUR—St. Lawrence
MATTITUCK HILLS—Suffolk
MIDDLE ISLAND—Suffolk
MOOERS*[1]—Clinton
NEWARK VALLEY—Tioga
PATCHOGUE—Suffolk
PENNELLVILLE—Oswego
PULASKI—Oswego
RICHVILLE—St. Lawrence
SPENCER—Tioga

North Carolina
ANDERSON CREEK—Harnett
BENN KNOB—Cleveland
BUNNLEVEL—Harnett
CASAR—Cleveland
MOUNT PLEASANT*—Cabarrus
OLIVIA—Harnett
VALDESE—Burke

North Dakota
BLUE HILL—McLean
DOUGLAS WEST—McLean
MAKOTI SW—Mountrail

Oklahoma-Texas
RANDLETT*—Cotton

Oregon
EAGLE CAP*—Union
DETROIT*—Marion
GARWOOD BUTTE*—Douglas
GASTON—Washington
HIGH ROCK*—Clackamas
IMNAHA*—Wallowa
PROSPECT*—Jackson
SHERIDAN—Yamhill
SILVERTON—Marion
SUMMIT LAKE*—Klamath
WOODBURN—Marion

Pennsylvania
EAST GREENVILLE[1]—Montgomery
HARRISBURG*[1]—Dauphin

Pennsylvania-New Jersey
RIEGELSVILLE[1]—Bucks

Puerto Rico
RINCON[1]—Aguadilla

Rhode Island
NORTH SCITUATE[1]—Providence

South Carolina
SUMTER WEST—Sumter

South Dakota
CROOKS TOWER—Lawrence
CROWS NEST PEAK—Pennington
CUSTER*[2]—Custer
DEERFIELD—Pennington
DITCH CREEK—Pennington
MEDICINE MOUNTAIN—Pennington
MINNESOTA RIDGE—Lawrence
NAHANT—Lawrence
ROCHFORD—Pennington

Tennessee
ADAMS—Robertson
COMO—Henry
HARRIS—Obion
HENRIETTA—Cheatham
LASCASSAS—Rutherford
LATHAM—Weakley
McCONNELL—Obion
NOLENSVILLE—Williamson
PALMERSVILLE—Weakley
PIGEON FORGE[1]—Sevier
PLEASANT VIEW—Cheatham

Texas
ABILENE EAST—Taylor
ABILENE WEST—Taylor
BRUCEVILLE—McLellan
CARSLBAD*—Tom Green
CHILTON—Falls
ELM MOTT—McLennan
EOLA*—Concho
HAMBY—Taylor
HARRIET*—Tom Green
HAWLEY—Jones
HAWLEY*—Jones
KIRBY LAKE*—Taylor
KNICKERBOCKER*—Tom Green
LAKE WICHITA—Wichita
LORENA—McLennan
LUBBOCK*[2]—Lubbock
MARLIN—Falls
MAURICEVILLE[1]—Orange
McCLANAHAN—Falls
MEADOW*—Terry
MERKEL*—Taylor
MILES*—Runnels
MOUNT NEBO—Tom Green
NOODLE*—Jones
NUGENT*—Jones
PORT ARTHUR NORTH[1]—Jefferson
RIESEL—McLennan
ROBINSON—McLennan
SAN ANGELO SOUTH—Tom Green
TERRY[1]—Orange
TEXLA[1]—Orange
WACO EAST—McLennan
WICHITA FALLS EAST—Wichita
WOLFFORTH*—Lubbock

Texas-Louisiana
ORANGEFIELD[1]—Orange
ORANGEFIELD*[1]—Orange
PORT ARTHUR*[2]—Jefferson
PORT ARTHUR SOUTH[1]—Jefferson
WEST OF GREENS BAYOU—Cameron

Utah
HARTS POINT*—San Juan
HATCH POINT*—San Juan

Virginia
DISPUTANTA SOUTH[1]—Prince George

Virginia-West Virginia
BLAND*—Bland

Washington
BUCKLEY—Pierce
CONWAY—Skagit
ENUMCLAW—King
KAPOWSIN*—Thurston
LA CONNER—Skagit
MOUNT VERNON—Skagit
WHEELER—Grant

Wisconsin
MELLEN—Ashland
MT. WHITTLESEY—Ashland

Wisconsin-Michigan
LITTLE GIRLS POINT*—Gogebic

Wisconsin-Minnesota
MILLTOWN*—Polk

Wyoming
BONNEVILLE[1]—Fremont
CROWHEART NE[1]—Fremont
DOUBLE BUTTE[1]—Fremont

HIDDEN VALLEY[1]—Fremont
HUDSON[1]—Fremont
JEFFREY CITY[1]—Fremont
JENKINS MOUNTAIN[1]—Fremont
MILES RANCH[1]—Fremont
PUDDLE SPRINGS[1]—Fremont
RATHBUN RANCH[1]—Hot Springs
RED CANYON[1]—Fremont

In addition to the standard series of quadrangle maps, small-scale (1:250,000) maps of areas in the United States and Territories are being published and distributed. They may be purchased from the Geological Survey for 50 cents per copy. An index to the series is available on request.

Alaska
NUSHAGAK BAY†
ST. LAWRENCE†

Arizona
GRAND CANYON

Arizona-New Mexico
CLIFTON
ST. JOHNS

Colorado
DENVER
PUEBLO

Colorado-Kansas
LIMON

Colorado-Nebraska-Kansas
STERLING

Colorado-Wyoming
CRAIG
GREELEY

Florida
ORLANDO

Idaho
POCATELLO

Iowa
FORT DODGE

Kansas
GREAT BEND

Minnesota
BEMIDJI
BRAINARD
HIBBING
INTERNATIONAL FALLS
NEW ULM
ST. CLOUD

Minnesota-Canada
ROSEAU

Minnesota-Wisconsin
DULUTH

Mississippi-Alabama
HATTIESBURG
WESTPOINT

Nebraska-Kansas
GRAND ISLAND
McCOOK

New Mexico
ALBUQUERQUE
FORT SUMNER
ROSWELL
SANTA FE
SOCORRO
TULAROSA

New Mexico-Arizona
GALLUP
SHIPROCK
SILVER CITY

New Mexico-Colorado
AZTEC
RATON

New Mexico-Texas
CARLSBAD
HOBBS

North Dakota
MINOT

Oklahoma
WOODWARD

Oklahoma-Texas
LAWTON

South Dakota
PIERRE

South Dakota-Nebraska
HOT SPRINGS

Texas
BAY CITY

Texas-Louisiana
PORT ARTHUR

Texas-Mexico
VAN HORN

Texas-New Mexico
BROWNFIELD

Texas-New Mexico-Oklahoma
DALHART

Texas-Oklahoma-Kansas
PERRYTON

Utah-Colorado
VERNAL

Wyoming
LANDER

Wyoming-Colorado
RAWLINS

Wyoming-Nebraska
TORRINGTON

Wyoming-South Dakota-Nebraska
NEWCASTLE

Special metropolitan-area and vicinity maps of major United States cities the being published and distributed by the Geological Survey. These maps are prepared from standard 7½-minute maps at the scale of 1:24,000. Vicinity maps may be purchased from the Geological Survey for the prices indicated below.

PORTLAND, VANCOUVER, AND VICINITY (50 by 70 inches) $1.50

State maps are also being published and distributed. These maps may be purchased from the Geological Survey for the prices indicated below.

#KENTUCKY (base map). (27 by 57 inches) 1:500,000 scale. $1.
KENTUCKY (topographic). (27 by 57 inches) 1:500,000 scale. $2.
#MARYLAND AND DELAWARE (base map). (12 by 19 inches) 1:1,000,000 scale. 20¢.
#NEW JERSEY (base map). (12½ by 15 inches) 1:1,000,000 scale. 20¢.
#NEW MEXICO (base hap). (25 by 29 inches) 1:1,000,000 scale. 20¢.
#NEW YORK (base map). (23 by 29 inches) 1:1,000,000 scale. 20¢.
#NORTH CAROLINA (base map). (14 by 33 inches) 1:1,000,000 scale. 20¢.
#OREGON (base map). (22 by 28 inches) 1:1,000,000 scale. 20¢.
#PENNSYLVANIA (base map). (15 by 23 inches) 1:1,000,000 scale. 20¢.

# Indicates that map does not show contours.

The maps listed below were prepared for military use but have been reprinted in civil editions. They are on International Maps of the World sheet lines and sheet numbering system but do not meet IMW specifications in all respects. Heights are shown in meters by gradient tints. (24 by 26 inches) (1:1,000,000 scale series) $1.

United States
BIG HORN MOUNTAINS
CHESAPEAKE BAY
DAKOTAS
JACKSONVILLE
MINNEAPOLIS
VICKSBURG
WHITE LAKE

North America
HUDSON RIVER

Lake Survey Charts

PUBLICATION of new editions of the following Lake Survey Charts has been announced by the United States Lake Survey of the Corps of Engineers, U. S. Army. Copies of these charts may be obtained from the U. S. Lake Survey, 630 Federal Building, Detroit 26, Mich., at 75 cents per copy. Payment is required in advance by P. O. money order or draft, payable to the Treasurer of the United States. A catalog showing the areas described below is available free upon request.

3.—Lake Erie. General chart of the entire lake at 1 : 400,000 scale. (March 1958.)
6.—8 raits of Mackinac. False Detour Channel and Presque Isle, Mich., to Point Epoufette, Mich., and Little Traverse Bay, Mich., at 1 : 120,000 scale. (March 1958.)
14.—St. Lawrence River. Ogdensburg, N. Y., to Brockville, Ont., at 1 : 30,000 scale. Inset: Ogdensburg, N. Y., and Prescott, Ont., at 1 : 15,000 scale. (April 1958.)
15.—St. Lawrence River. Brockville, Ont., to Deer Island, at 1 : 30,000 scale. (May 1958.)
16.—St. Lawrence River. Deer Island to Bartlett Point Light, at 1 : 30,000 scale. Insets: Clayton, N. Y., at 1 : 10,000 scale. Alexandria Bay, N. Y., at 1 : 10,000 scale. (May 1958.)
18.—St. Lawrence River. Cape Vincent, N. Y., and Howe Island, Ont., to Allan Otty Shoal, N. Y., and Ninemile Point Light, Ont., at 1 : 30,000 scale. (April 1958.)
42.—Lake St. Clair. The entire lake including St. Clair River to Woodtick Island at 1 : 60,000 scale. (March 1958.)
51.—Coast Chart. Head of St. Clair River to Pte. aux Barques, Mich., and to Port Albert, Ont., at 1 : 120,000 scale. Insets: Harbor Beach, Mich., at 1 : 10,000 scale. Port Sanilac Mich., at 1 : 5,000 scale. (February 1958.)
60.—Coast Chart. Detour passage to Waugoshance Point, Mich., at 1 : 80,000 scale. Insets: Cheboygan, Mich., at 1 : 15,000 scale. Mackinac Island, Mich., at 1 : 10,000 scale. Macinaw City, Mich., at 1 : 15,000 scale. St. Ignace, Mich., at 1 : 15,000 scale. (February 1958.)
94.—Coast Chart. Big Bay Point, Mich., to Redridge, Mich., including Keweenaw Peninsula and Keweenaw Waterway, at 1 : 120,000 scale. Insets: Eagle Harbor, Mich., at 1 : 15,000 scale. Cooper Harbor, Mich., at 1 : 15,000 scale. (April 1958.)
95.—Coast Chart. Redridge, Mich., to Little Girls Point, Mich., at 1 : 120,000 scale. Inset: Ontonagon, Mich., at 1 : 10,000 scale. (March 1958.)
97.—Coast Chart. Beaver Bay, Minn., to Pigeon Point, Minn., at 1 : 210,000 scale. Insets: Silver Bay, Minn., at 1 : 10,000 scale. Taconite Harbor, Minn., at 1 : 10,000 scale. Grand Marais, Minn., at 1 : 10,000 scale. (March 1958.)
944.—Keweenaw Waterway, Mich., including Torch Lake at 1 : 30,000 scale. Inset: Hancock and Houghton, Mich., at 1 : 10,000 scale. (April 1958.)
961.—Apostle Islands, Wis., and coast from Oronto Bay to Sand Island Light, Wis., including Chequamegon Bay at 1 : 60,000 scale. Inset: Bayfield, Wis., at 1 :10,000 scale. (March 1958.)

Public Land Survey Plats

THE FOLLOWING plats of public land surveys and resurveys were completed and accepted by the Bureau of Land Management between March 1 and May 31, 1958. The class or purpose of the survey is indicated. Copies of plats may be secured from the Bureau offices in the States or from the Director, Bureau of Land Management, Department of the Interior, Washington, D. C.

Alaska

U. S. Survey No. 3447—Kalgin Island Small Tracts
U. S. Survey No. 3464—Island Lake Small Tracts
U. S. Survey No. 3466—Dark Lake Small Tracts
U. S. Survey No. 3475—North Sitka Highway Small Tracts
U. S. Survey No. 3481—North Sitka Highway Small Tracts

Alaska—Fairbanks Meridian

T. 2 S., R. 3 E.—Survey, part of subdivision
T. 4 S., R. 4 E.—Survey, part of subdivision

Arizona—Gila and Salt River Meridian

T. 3 S., R. 10 W.—Survey of subdivision
T. 3 S., R. 11 W.—Survey of subdivision

California—San Bernardina Meridian

T. 19 N., R. 6 E.—Skeleton survey
T. 19 N., R. 7 E.—Skeleton survey
T. 19 N., R. 8 E.—Skeleton survey
T. 19½ N., R. 6 E.—Skeleton survey
T. 19½ N., R. 7 E.—Skeleton survey
T. 19½ N., R. 8 E.—Skeleton survey
T. 20 N., R. 5 E.—Skeleton survey
T. 20 N., R. 6 E.—Skeleton survey

Colorado—Sixth Principal Meridian

T. 10 S., R. 89 W.—Dependent resurvey–part
T. 19 S., R. 72 W.—Department resurvey–part

Colorado—New Mexico Principal Meridian

T. 47 N., R. 3 E.—Department resurvey–part

Idaho—Boise Meridian

T. 16 N., R. 20 E.—Extension survey
T. 17 N., R. 20 E.—Extension survey
T. 14 S., R. 12 E.—Dependent resurvey
T. 14 S., R. 13 E.—Dependent resurvey
T. 8 S., R. 19 E.—Supplemental survey
T. 9 S., R. 21 E.—Supplemental survey
T. 16 S., R. 22 E.—Dependent resurvey
T. 8 S., R. 23 E.—Supplemental survey (3 plats)
T. 9 S., R. 23 E.—Supplemental survey
T. 15 S., R. 23 E.—Dependent resurvey
T. 16 S., R. 23 E.—Dependent resurvey
T. 7 S., R. 24 E.—Supplemental survey
T. 8 S., R. 24 E.—Supplemental survey (2 plats)
T. 13 S., R. 25 E.—Dependent resurvey
T. 14, S., R. 25 E.—Dependent resurvey

Kansas—Sixth Principal Meridian

T. 7 S., R. 15 W.—Dependent resurvey–part
T. 7 S., R. 16 W.—Dependent resurvey–part

Michigan—Michigan Meridian

T. 8 N., R. 5 E.—Survey of islands (3 plats)
T. 43 N., R. 3 E.—Survey of islansd
T. 43 N., R. 4 E.—Survey of islands
T. 22 N., R. 9 W.—Survey of islands

Minnesota—Fourth Principal Meridian
T. 46 N., R. 26 W.—Survey of islands
Ts. 43 & 44 N., R. 32 W.—Survey of islands

Minnesota—Fifth Principal Meredian
T. 132 N., R. 29 W.—Survey of islands

Montana—Principal Meridian
T. 11 N., R. 17 W.—Dependent resurvey and subdivision of section

Nevada—Mt. Diablo Meridian
T. 45 N., R. 37 E.—Resurvey and extension survey
T. 17 N., R. 52 E.—Independent resurvey–East boundary
T. 18 N., R. 52 E.—Independent resurvey–East boundary
T. 19 N., R. 53 E.—Survey of subdivisions
T. 13 S., R. 47 E.—Township exterior surveys
T. 14 S., R. 47 E.—Township exterior surveys
T. 14 S., R. 48 E.—Township exterior surveys
T. 14 S., R. 49 E.—Township exterior surveys
T. 15 S., R. 48 E.—Township exterior surveys
T. 15 S., R. 49 E.—Township exterior surveys
T. 15 S., R. 50 E.—Township exterior surveys
T. 22 S., R. 59 E.—Subdivision of sections
T. 22 S., R. 61 E.—Subdivision of sections
T. 23 S., R. 60 E.—Subdivision of sections
T. 23 S., R. 61 E.—Subdivision of sections

New Mexico—New Mexico Principal Meridian
T. 2 N., R. 3 W.—Dependent resurvey
T. 29 N., R. 8 W.—Dependent resurvey
T. 17 S., R. 13 E.—Subdivision of section
T. 10 S., R. 15 E.—Dependent resurvey

North Dakota—Fifth Principal Meridian
T. 150 N., R. 71 W.—Dependent resurvey
T. 151 N., R. 71 W.—Dependent resurvey
T. 150 N., R. 72 W.—Dependent resurvey
T. 151 N., R. 72 W.—Dependent resurvey
T. 150 N., R. 73 W.—Dependent resurvey
T. 151 N., R. 73 W.—Dependent resurvey
T. 150 N., R. 74 W.—Dependent resurvey

Oregon—Willamette Meredian
T. 34 S., R. 1 E.—Dependent resurvey–part
T. 24 S., R. 4 W.—Dependent resurvey–part
T. 29 S., R. 5 W.—Dependent resurvey–part
T. 17 S., R. 7 W.—Dependent resurvey–part

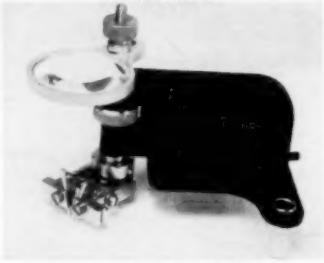
South Dakota—Fifth Principal Meridian
T. 114 N., R. 68 W.—Dependent resurvey

Utah—Salt Lake Meridian
T. 3 S., R. 2 E.—Survey–part of subdivisions
T. 3 S., R. 3 E.—Survey–part of subdivisions

Wyoming—Sixth Principal Meridian
T. 43 N., R. 75 W.—Dependent resurvey
T. 43 N., R. 76 W.—Dependent resurvey
T. 44 N., R. 76 W.—Dependent resurvey
T. 43 N., R. 77 W.—Dependent resurvey
T. 20 N., R. 85 W.—Dependent resurvey

T. 3 N., R. 3 E.—Supplemental survey
Wyoming—Wind River Meridian

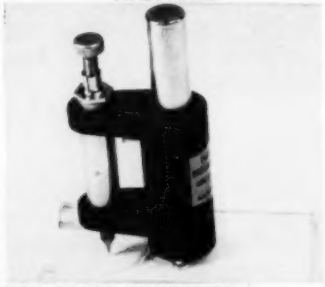
UNI-GRAVER
TRADE MARK



SCRIBING INSTRUMENT for paint-coated plates

The UNI-GRAVER employs either needles or flat blades in an interchangeable adapter (Pat. No. 2,735,177, 2,735,178, 2,782,501). Constructed of nickel-plated brass with wrinkled finish, it is fitted with a Bausch & Lomb 2" focal length optic, adjustable at any position.

UNI-DOTTER
TRADE MARK



FOR MAPS ENGRAVED ON COATED PLASTIC SHEETS

The manually-operated UNI-DOTTER is designed to mechanically engrave dot symbols, both uniform and clear, for maps engraved on coated plastic sheets. Pat. #2,825,136. It is manufactured of nickel-plated brass with wrinkled finish and mounted on a plastic base.

All Instruments Guaranteed Unconditionally For Workmanship And Materials

See our Catalog for details on the various adaptations of the UNI-GRAVER, the UNI-DOTTER and the fine-line UNI-PENS.

UNIVERSAL INSTRUMENT CO. • 3807-11 Bunker Hill Road, Brentwood, Md. • WA 7-8957

Comment and Discussion

The pages of SURVEYING AND MAPPING are open to a free and temperate discussion of all matters pertaining to the interests of the CONGRESS. It is the purpose of this Department to encourage comments and published material or the presentation of new ideas in an informal way.
—EDITOR

NEW ZEALAND EQUIPMENT AND METHODS

JOHN B. MACKIE*—I have read with more than a little interest the Panel Discussion on "Is Surveying and Engineering Equipment, Available Today, Satisfactory?" which commences on page 391, No. 4, Volume XVII, of SURVEYING AND MAPPING. I thought that your readers might perhaps be interested in some of the equipment and methods used in New Zealand for everyday land-surveying work, and I have therefore appended a few notes which you are at liberty to publish if you so wish.

1. *Surveying Tapes:* In this country our land surveyors, almost without exception, use a steel ribbon one-sixteenth of an inch wide and approximately 0.02 inch thick. Since all our measurements for land transfer work are made in chains, links, and decimals of a link, the tapes are graduated in chains and links (one chain = 66 feet = 100 links). The ordinary tape is six chains long and is wound on a brass drum with an inside winding cylinder 4 inches in diameter, the outside diameter of the drum faces being 6½ inches, and the width between faces is 1¾ inches. The drum has a leather handstrap across the fixed face, while the other, rotating face is equipped with a short winding handle near the periphery and a central clamp-type brake consisting of a wing-nut, brass washer, and a leather washer.

The tape itself is subdivided into six single chains by means of brass sleeves, about five-eighths of an inch long, correctly located and soldered on to it; each sleeve carries an engraved index mark, and its appropriate number is indicated by dots and Roman numerals (e.g. . for one chain, .. for two chains, etc., and v for five chains). The last chain to be wound on to the drum is called the "reader" band, and it is subdivided down to single links by further brass sleeves. The sleeves marking the individual links are 0.2 inch long, except for those marking the fives and tens; the fives are 0.275 inch long and are made of German silver to differentiate them clearly from the others. The tens are 0.575 inch long and are marked with dots and Roman numerals (e.g. . for ten links, .. for twenty links, etc., v . for sixty, v .. for seventy, etc., and x for one hundred).

The subdivision of the tape is fairly clear from Fig. 1 of the accompanying diagram. The steel ribbon is, of course, continuous throughout the whole length of the main band and reader.

Fig. 2 illustrates a portion of the reader band.

The brass sleeves are all a close sliding fit on the band; they are tinned with solder on the inside and are soldered into position so that the solder runs out of the sleeve for a short distance

* M.Sc., B.E., A.O.S.M., M.S.I. (N.Z.), A.M.I.M.M., A.M.N.Z.I.E., F.G.S., Registered Surveyor, and Senior Lecturer in Surveying, School of Mines and Metallurgy, University of Otago, Dunedin, New Zealand

Winding drum, one-sixteenth-inch steel tape, link-stick, and spring balance.

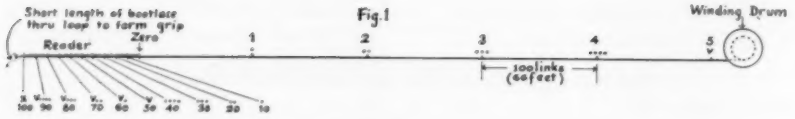


Fig. 1

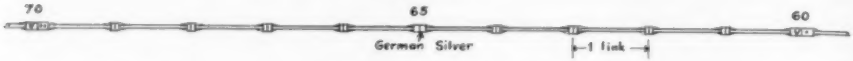


Fig. 2

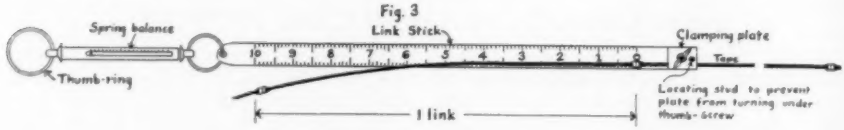


Fig. 3

on each side. When the solder is cleaned off with emery cloth the sleeve is no more than a slight "bump" on the tape and it then has no sharp edges to catch on things.

The usual weight of the above bands (excluding reader) is 0.2183 pound per chain (66 feet). Cost at the present time would be between forty-five and fifty dollars (about £16 New Zealand currency) including the winding drum.

In use, the instrumentman holds the reader at the end (100 link mark) while the chainman walks to the next station with the drum, letting the tape unwind as he goes. When he gets to the forward station he stops, turns round and waves the instrument man away. The instrument man then walks slowly away from him pulling the tape as he goes. As soon as the chainman sees a chain mark appear off the drum, he signals the instrumentman to stop; the latter then drops the end of the band and walks back to the instrument where he picks up the reader and is ready to make the measurement. The chainman clamps up the drum and holds the chain mark lightly against the sighting point. The instrumentman pulls up the tape to the axis of the transit and applies approximately the correct tension to get a rough reading, i.e., to locate the two link marks between which the axis of the instrument lies. He then lowers the tape and clamps what we call a "link-stick" (sometimes also called a "chain-stick") on to the band with its zero at the link mark in front of the axis. The link-stick is usually a piece of brass about eleven inches long with a thumb-screw and clamping-plate at one end to enable it to be attached firmly to the tape, and a spring-balance attached to the other end by a ring. The body of the "stick" is graduated in tenths and hundredths of a link. Fig. 3 gives some idea of what the link-stick looks like.

After affixing the link-stick, the instrumentman pulls up the stick and tape to the transit axis (or chaining-thorn if the transit has one) and gradually applies the tension to the full amount (15 pounds in the case of our one-sixteenth inch tapes). When the tape is steady, he reads the tenths and hundredths of a link on the stick and adds them to the reading of the link-sleeve at the zero of the stick. The chainman should signal the number of full chains on the mark at his end at the beginning of the measurement. For example, the chainman signals three chains; the reader up to the sleeve at the zero of the link-stick shows 43 links, and the stick shows 0.27 link; total distance is 343.27 links. The instrumentman books this figure, reads the vertical angle to the forward station and books it, then he reads and books the air temperature. Measurements are usually made with the tape supported at the two ends only, unless the line is a long one, when a center support is used. In the office the field measurements are subsequently corrected for temperature, sag, and slope.

Temperature corrections are straightforward, and sag corrections are based upon the formulae:

$$S_o = L \times \tfrac{1}{3} \text{ versin } \phi$$

$$\text{Where Sin } \phi = \frac{W}{2T}$$

$S' = S_o \times (\text{cosine})^2$ of angle of inclination.
L = length of band, W = total weight of length of band in use,

T = tension applied in pounds, S_o = sag for 0° inclination, and
S' = sag for an inclined line.

Tables are, of course, available for ascertaining quickly the temperature and sag corrections.

The New Zealand Government Lands & Survey Department will, for a small fee, compare a surveyor's tape with a standard band and provide a correction table. Surveyors must take advantage of this service periodically if their measurements are to be kept within the limits specified in our Survey Regulations.

Although our tapes are normally graduated in chains and links, manufacturers in this country will supply one-sixteenth inch tapes graduated in hundred-foot lengths with the reader divided into single feet. A link-stick graduated in tenths and hundredths of a foot is also obtainable. A five-hundred-foot tape of this kind would fit easily on the drum described above. (Note: a link-stick over a foot long, plus the length of the spring-balance, becomes a little unwieldy, but it is a simple enough matter to incorporate the spring-balance in the body of the stick, with a slot for the traveling pointer and a red mark to indicate the correct tension.)

It may be felt that the one-sixteenth-inch tape would not be sufficiently robust for routine measurement of rough terrain, but our tapes are surprisingly strong and in my experience are broken only by careless handling. They have the great advantage of lightness and therefore the sag corrections are much less and also much less uncertain.

For your interest, the Survey Regulations here (under the Surveyors Act of Parliament) are: (Part Regulation 12)

"The surveyor shall use such equipment and methods as will ensure that the length of any line shown on the plan shall not depart from its true standard length by more than the limits of error set out hereunder:—

Town Surveys: 0.10 link, plus 0.005 link for each complete 100 links of measured line.

Rural Surveys: The limit of error prescribed for Town Surveys increased by 100 per cent."

2. *Transits:* Most surveyors in New Zealand are now equipped with optical-reading transits of British or Continental makes. Many of these incorporate optical plummets or optical centering in some form or other.

The four-screw base has been obsolete in New Zealand for a great many years, the three-screw base or tribrach being in universal use. The latter is much quicker to use, and in my opinion is better, because it avoids the strain which can be set up in a four-screw base by the working of the diametrically opposite leveling screws against each other. I have several old four-screw base instruments here in the category of "museum pieces," and it is obvious from an inspection of them that considerable wear has taken place in their bases, and that lack of stability has resulted from this.

3. *Leveling Rods:* Most leveling rods in use here are of the "Sopwith" type, telescopic in three sections and made of wood with the graduations and figures painted upon the face. I agree that a plastic face carrying the graduations would be an advantage, since it could probably be kept clean and bright by occasional wiping with a damp cloth. One of the disadvantages of wooden rods is that the reading face, particularly that on the bottom section, becomes ingrained with dirt and can only be rejuvenated by supplying a completely new face.

In concluding this letter, I would like to say that I have followed with interest the papers and discussions which have appeared from time to time in SURVEYING AND MAPPING on the subject of Surveying Education in the U.S.A. Although we have an excellent standard of surveying here and our profession stands high in its integrity, we, too, have educational problems, and I am taking the liberty of enclosing a reprint of a paper submitted by me last October to the Annual Conference of the New Zealand Institute of Surveyors. The Institute has approved the suggestions put forward in the paper, and the matter of having a full-time University Diploma course in Surveying instituted in the University is now being explored.

SOMETHING NEW IN ADJUSTING PINS

HAROLD L. WOOLLEY*—While working in the field recently, I had occasion to check the dumpy level that I was using.

We set up in the middle between two stakes two hundred feet apart, read the rods, noted the difference, set up on the far side of one of the stakes, read the rods, and found the instrument to be several hundredths out of adjustment.

We looked in the case for the adjusting pin, but there was none. We hunted in all our equipment for one and checked our nail supply for one small enough, but no luck.

We tried the end of a ball-point pen and it fitted very well. We took the inside out of it for easier handling, made our adjustment, and were on our way.

This experience should be of value to all of us in the surveying and mapping field.

* 14260 San Jose St., San Fernando, California.

News of Related Organizations

San Joaquin Valley Surveyors Conference

Editor's Note:—The following report was abstracted from reports furnished by Conference Chairman Edward F. Kulhan and by one of his civil engineering students whose name we were not able to learn. Paul J. Dowling, the very active editor of the Northern California Section of ACSM was instrumental in obtaining these reports for publication.

April 4th and 5th, 1958, were important days for surveyors of the San Joaquin Valley area of Northern California, for on those dates Fresno State College sponsored the San Joaquin Valley Surveyors Conference of 1958. It is certain that the surveyors themselves realized that this was an important conference, for 188 of them attended despite heavy rains and flooding which undoubtedly kept some away.

Edward F. Kulhan of the Department of Engineering, Fresno State College, served capably as Chairman of the Conference. Judging from the attendance, he had able assistance from Ernest Wolf, who had charge of registration and publicity.

A welcome to those attending was extended by Herbert H. Wheaton, Dean of Arts and Sciences of the College.

The two days of technical sessions included papers and panel discussions on many phases of surveying and mapping, ranging from a talk on "The Care and Use of Surveying Instruments," to a panel discussion on "Photogrammetry in Engineering Projects," and from "Land Subsidence in the San Joaquin Valley" to "Surveying in the Junior Colleges and State Colleges—Are They Doing the Job Expected of Them?" There were also talks on State Plane Coordinates, on the use and availability of control, on property surveying and the surveyor in court, and a panel discussion on cooperation among surveyors and pooling of data. All the papers were so interestingly presented that, to quote one well known member, "the exhibits were left abandoned during the talks."

—Robert C. Eller

The Canadian Institute of Surveying

In Surveying and Mapping, Vol. XVII, No. 1, January–March 1957, page 104, there appeared a short item, "A Bit of Canadian Surveying History," which consisted chiefly of a quotation from the *Canadian Surveyor*, Vol. XIII, No. 4, page 193, in which a very brief history of the then Canadian Institute of Surveying and Photogrammetry was detailed.

The following, from page 2 of an index of publications issued as part of the commemorative program of the Fiftieth Anniversary in 1957, brings this nomenclature situation up to date.

"The Canadian Institute of Surveying began in the year 1882 as the Association of Dominion Land Surveyors. In 1934 the name was changed to The Canadian Institute of Surveying, and in 1950 it was again changed to The Canadian Institute of Surveying and Photogrammetry. At the Annual Meeting of 1957 it was decided to revert to the name of The Canadian Institute of Surveying."

In commenting upon this most recent change of name, ACSM's Executive Secretary, Walter S. Dix, says:

"The above reversion to Institute of Surveying has more than casual importance on analysis. The new recognition seems to be that the professional field of interest is *surveying*, and that the pertinent specialties and tools such as photogrammetry; electronic distance measurement; air, ground, and hydrographic surveying; etc., are subjunctive to the whole and thus the former name 'Surveying' is most appropriate. This viewpoint is well expressed between the lines of Dr. L. E. Howlett's paper on 'Distance Measurement' given at the Canadian Institute's meeting, and read (in whole or in part) by Colonel Ladd, at the ACSM 17th Annual Meeting, in presenting 'The Tellurometer.'"

California Surveyor's Organization Actively Supports Surveyor Registration Laws

Paul J. Dowling, Editor, Northern California Section, ACSM, and an active member of the Sonoma, Lake, and Mendocino Counties Civil Engineer's and Land Surveyor's Association recently sent to the Publications Committee of ACSM a clipping from *The Press Democrat* of Santa Rosa, Calif., dated June 3, 1958.

The clipping is a published list of all members of the three-county association, together with several paragraphs of quotations from the California Statutes regarding land surveying practice in that State. This is apparently an effort by the association to bring to the attention of all surveyors, as well as the general public, that it is unlawful for anyone who is not properly qualified and registered to practice, or to offer to practice, land surveying in that State.

Mr. Dowling attached a note to the effect that this is the first time the law quotations have been included in the announcement, implying that the membership list has been published before.

We salute this active effort to discourage and prevent improper survey practice and would like to see the same sort of effort made in all parts of the country.

—Robert C. Eller
Director, ACSM

International Cartographic Conference

Some of the world's leading map makers, attending the Rand McNally International Cartographic Conference agreed to exchange information on mapmaking processes and techniques. The conference was held in Shepard Hall on the Evanston, Ill., campus of Northwestern University, June 15–21, 1958.

Delegates to the conference designated a committee of six, appointed two years ago at the first International Conference in Stockholm, to meet with representatives of national cartographic societies to establish machinery for the further exchange of cartographic information and to lay plans for future conferences.

Dr. Erwin Gigas, Director of Institut Fur Angewandte Geodasie, Frankfurt, secretary of the committee of six, said the organizational meeting would be held as soon as possible in Frankfurt.

Other members of the committee are Duncan Fitchet, General Manager of Rand McNally's Creative Division; Stephane de Brommer, of Institut Geographique National, Paris; Brig. Gen. Lewis J. Harris, Director of map production and publication for the British Ordnance Survey, London; Dr. Carl Mason (cq) Mannerfelt, of Esselte, Stockholm; and Dr. Daniel Chervet, of Bern, Switzerland.

Delegates to the conference included top cartographic experts from England, Canada, Germany, Switzerland, Sweden, and France. In addition, there was one delegate from Warsaw, Poland, whose attendance was arranged by the East-West contacts staff of the U. S. State Department.

Also in attendance were representatives of the U. S. State Department, Aeronautical Chart and Information Center, Coast and Geodetic Survey, Geological Survey, Navy Hydrographic Office, and Army Map Service, as well as Rand McNally officials.

The conference was the second to be held, the first having been held in 1956 in Stockholm.

Among the subjects discussed were map design, compilation, drafting, relief techniques, reproduction processes, corrections and revisions, and education and training.

Among those attending the conference were Andre Amiel, of Manufacture Francaise de Pneumatique Michelin, Paris; Col. Edgar Douglas Baldock, chief cartographer for the Canadian Department of Mines and Technical Surveys; Edward B. Espenshade, Jr., chairman of the Department of Geography at Northwestern University; Col. Robert E. Herndon, Jr., commander of the U. S. Air Force Aeronautical Chart and Information Center; Prof. Eduard Imhof, of Kartographisches Institut, Zurich, Switzerland, a foremost authority on relief cartography; Dr. Wolfgang Pillewizer, technical manager of Karl Wenschow, famous German map maker; Hal Shelton, of Golden, Colo., prominent relief artist; Charles S. Spooner, Jr., chief of the Technical Developments Staff of the U.S. Army Map Service; and Herbert E. Stussi, manager of Orell Fussli Arts Graphiques SA, Zurich, famous high quality printing firm.

The delegate from Poland was Jan Rzedowski, director of Panstwowe Przedsiebiorstwo Wydawnictw Kartograficznych, Warsaw.

The conference delegates toured governmental agencies in Washington the following week.

CONGRESS NEWS

Colorado Section

The month of May was an active one for the Colorado Section of ACSM, with three well-attended events taking place.

To start the busy month, a business meeting was held May 1st in the Auditorium of Building 25, Denver Federal Center, with 79 members and guests attending. The Engineer Research and Development Laboratories, Fort Belvoir, Va., loaned their film "Operation of the Tellurometer" to the Section for the meeting. After the film showing, Section Chairman Emmett J. Coon introduced W. A. McLaughlin, District Engineer, USGS, who discussed his experiences with the Tellurometer during winter-season control projects in Texas.

On May 22nd the Section was host at a joint dinner and informal meeting of ACSM and ASP local sections. The 63 members and guests who attended the affair, held at Pomponio's Restaurant in Denver, were entertained with slides and interesting commentary by Mr. and Mrs. Jose Goncalves on "Africa as We Lived It." Mr. Goncalves is a cartographer with the Geological Survey.

The Tellurometer was again the focus of attention when, on May 24th, a field demonstration of this instrument was conducted at the Denver Federal Center. W. A. McLaughlin explained the instrument and the procedures used while USGS engineers Arthur Gervais, Jr., George M. Barker, and Irvin J. Benes made a set of readings over a measured course. Those present were given an opportunity to read the instrument and discuss its use with the engineers.

—JOHN R. CLEMENS
Section Editor

Louisiana Section

All previous records for attendance at meetings of the Louisiana Section were broken when 110 members and guests turned out for the Annual Dinner Meeting on April 22, 1958, at the Engineers Club in the DeSoto Hotel in New Orleans. The dinner meeting followed a cocktail hour, and fittingly climaxed a successful year for the Section under the Chairmanship of of George Jones.

1958 CHAIRMAN OF THE LOUISIANA SECTION, C. E. BRIDGES (*left*), AND 1957 CHAIRMAN GEORGE JONES

Following the dinner, former Chairman S. P. Chapman introduced the principal speaker of the evening, George C. Schoenberger, Jr., an attorney for the Shell Oil Company. Mr. Schoenberger gave a very interesting talk on "Some Legal Aspects of Surveying in Louisiana."

The new officers of the Section for 1958 were introduced by Mr. Jones, after which the meeting was turned over to the new Chairman, C. E. Bridges, who gave a brief report on his trip to the National Convention of ACSM in Washington.

Officers and directors of the Section for 1958 are as follows:

C. E. Bridges, *Chairman*
G. E. Mott, *1st Vice Chairman*
C. H. Fenstermaker, *2nd Vice Chairman*
R. C. Dayton, *3rd Vice Chairman*
H. G. Sneed, *Secretary*
H. G. Truelove, *Treasurer*
F. B. Sessums, *Director*
J. L. Fontcuberta, *Director*

—H. G. SNEED
Secretary

Northern and Southern California Sections Hold Joint Meeting

On Friday, May 2 and 3, 1958, the Annual Joint Meeting of the Northern and Southern California Sections of ACSM was held at the Miramar Hotel in Santa Barbara. Nearly 170 members and their wives attended the meeting, sponsored this year by the Southern California Section.

The Saturday afternoon program featured three very capable speakers. Jim Doud gave a most enlightening talk on the IBM Model 610 Autopoint Computer. Commander R. F. Freitag of the U. S. Navy Guided Missile Base discussed survey problems associated with guided missiles. The role and uses of photogrammetry in highway practice was enjoyably discussed by Rex Fulton of the California Division of Highways.

The social highlight of the meeting was the banquet and dinner dance. Some 100 members and their wives stayed over for this event.

—R. T. WHITE
Editor, SCS

OFFICERS OF THE NORTHERN AND SOUTHERN CALIFORNIA SECTIONS OF ACSM

Back row: W. A. White, *Secretary-Treasurer,* and C. O. Greenwood, *Chairman,* both of the Northern California Section. *Front row:* Reynold L. Pedersen, *Secretary,* Joseph J. Cooper, *Treasurer,* Harvey E. Rookus, *Chairman,* and Albert V. Cocking, *Vice Chairman,* all of the Southern California Section; and William Angeloni, *Vice Chairman,* Northern California Section.

Northern California Section

On April 25, 1958, the Northern California Section of ACSM met jointly with the Northern California Section of the American Society of Photogrammetry in Sacramento. Eighty-three persons attended the meeting, with the attendance about equally divided between the two organizations.

Prof. C. H. Drown, Sacramento State College, served as moderator for the three speakers who provided a fast-moving, instructive program for the attentive audience.

The talks were centered on the principal theme of extension of horizontal control by several different methods. D. R. Mayer, of Clair A. Hill & Associates, discussed two photogrammetric methods of control extension. He described some of his experiences with stereotemplets and with a graphic method of extending horizontal control.

J. D. Carter of the State Division of Highways described his experience with the Geodimeter. He explained how it is being used by the Highway Division, what for, and the results being obtained.

Another new distance-measuring device, the Tellurometer, was described and explained by A. H. Letey of the U. S. Geological Survey.

In the discussion period which followed the papers, Moderator Drown steered the discussion so as to bring out a comparison of the instruments as to cost, portability, facility of use, speed, and diversity of uses.

Continuing its policy of holding frequent meetings throughout the year at various cities and towns in the region, the Northern California Section held its fifth meeting of the year on the evening of May 28, 1958, in the Engineering Building at the University of California

in Berkeley. Forty-eight members and guests were present when Section Chairman C. O. Greenwood called the meeting to order.

After announcements by Vice Chairman William Angeloni concerning the June meeting to be held in San Jose, and by C. J. Aggeler concerning the important Western Regional Conference scheduled for Monterey in October, Honorary Member V. S. Seward introduced the featured speaker of the evening, William H. Chapman. A civil engineer with the U. S. Geological Survey in Sacramento, Mr. Chapman represented the Geological Survey on an Air Force expedition into Antarctica to test methods and equipment during the 1957–58 Antarctica summer.

Mr. Chapman described his work of establishing position on some twelve control stations on the "Frozen Continent" for the purpose of testing the usability of Raydist, an electronic distance-measuring system, in such areas. Mr. Chapman's work and his trips in and out were illustrated with some 200 slides.

C. J. Aggeler of San Francisco City College described the work being done at that institution which has earned for its surveying course accreditation by the Engineers Council for Professional Development.

C. H. Drown of Sacramento State College explained the civil engineering programs being offered at the State Colleges and the part surveying education has in the programs.

—WILLIAM A. WHITE
Secretary-Treasurer, NCS

Oregon

Following Vice President Bestor's meeting with a group of Oregon members of ACSM in Portland on May 26, 1958, a petition to form the Oregon Section of ACSM was approved. Fred M. Darby, Douglas County Surveyor, of Roseberg, Oregon, was named Temporary Chairman-Secretary-Treasurer of the forming group.

At its June 25th meeting in Portland, the virtual Oregon Section adopted its proposed Constitution and Bylaws which have been submitted to ACSM for approval. As of July 18th the document had been approved by ACSM Constitution routines, with recommendation for certification of charter. By the time this issue of SURVEYING AND MAPPING is delivered, it is expected that the Oregon Section of ACSM will be in full being.

ACSM membership chairman, Captain Frank S. Borden, says that new member activity from Oregon indicates the Section is actual and vigorous.

Utah

ACSM Vice President, George C. Bestor, reports a great deal of enthusiasm for an ACSM Section in the Salt Lake City, Utah, area. An organizational meeting was held May 20, 1958. Temporary Chairman of the forming group is Colonel Gerald FitzGerald of Salt Lake City, a past president of ACSM, recently retired from the U. S. Geological Survey. Professor Clifford G. Bryner of the University of Utah has been named Acting Secretary of the proposed Utah Section. His address is Annex 242, University of Utah, Salt Lake City, Utah.

Chairman FitzGerald reports interest in the activity from the Ogden area, where the Forest Service holds forth. It is expected that activity will accelerate with the beginning of the fall term at the university.

Maps for 1960 Census

The geographers of the Bureau of the Census have a gigantic task confronting them—and the deadline is only a year and a half away. Between now and April 1960, when the Bureau will begin taking the next census, approximately 250,000 separate maps will have to be compiled and printed.

As to area covered, these maps will range from a full township in many cases to areas as small or even smaller than a city block. Each map will cover the area to be worked by a single enumerator. There will be needed, of course, more than one copy of each map, so the total number of copies produced may well run to several millions.

The Bureau of the Census has taken over, temporarily at least, the old Quartermaster Depot at Jeffersonville, Ind., as a working area for the project. It is expected that approximately half a thousand people will be employed on this rush job.

Personals

Carl W. Keuffel, President of the Keuffel and Esser Company, Hoboken, N. J., received the honorary Doctorate of Engineering degree from Stevens Institute of Technology at the commencement exercises held June 14, 1958.

Mr. Keuffel received his degree in mechanical engineering from Stevens Institute in 1911 and the honorary degree was awarded by the Institute for his ". . . many contributions to the field of measurements. . . ."

He is a member of the American Society of Mechanical Engineers, American Society of Civil Engineers, American Ordnance Association, Optical Society of America, American Society of Photogrammetry, and the American Congress on Surveying and Mapping.

Mr. Keuffel has served the American Congress on Surveying and Mapping as Director (1949) and as Chairman of the Instruments Division (1953).

He received the 1956 Citizenship Award of the New Jersey Society of Professional Engineers ". . . for outstanding achievements in industrial statesmanship and humanities, and his everlasting endowment to public health, safety and welfare."

A group of students of photogrammetry from Syracuse University recently made a tour of the Bausch & Lomb Optical Company's Rochester, N. Y., plant, under the leadership of Professor **Arthur H. Faulds** of the Department of Civil Engineering at Syracuse University.

Rear Admiral **Charles Pierce,** Assistant Director, Coast and Geodetic Survey, has been awarded the medal of the Philippine Legion of Honor. The presentation was made on Friday, June 6, 1958, by Admiral **H. Arnold Karo,** Director, Coast and Geodetic Survey, on behalf of the Chief of Staff, Armed Forces of the Philippines. The citation read in part, "For exceptionally meritorious conduct in performance of outstanding service rendered in the Philippines during the period from 12 June 1947 to 30 June 1950." This period covered the organization and development of the Philippine Coast and Geodetic Survey.

Michael Baker, Jr., Rochester, Pa., has been designated as a recipient of one of the Pennsylvania State University Distinguished Alumnus Awards.

Donald A. Rice, Chief, Astronomy and Gravity Branch, Coast and Geodetic Survey, received the Colbert Medal for 1957 from the Society of American Military Engineers for important contributions to the Defense Department in connection with gravity and the deflection of the vertical. The Colbert Medal was donated to the S.A.M.E. by Rear Admiral **Leo O. Colbert,** formerly Director, Coast and Geodetic Survey, as an annual award to a member of the Survey, officer or civilian, either active or retired.

Deaths

Dr. Frederick M. Hart, 76, who retired from his position as cartographic engineer with the U. S. Geological survey in 1953, after 52 years of service with the U. S. Government, died in Silver Spring, Md., on June 27, 1958.

Dr. Hart was born in Waverly, N. Y., but came to Washington, D. C., while still a youngster. He graduated from the old Central High School and from Columbian College Medical School. During his student days he worked for the Coast and Geodetic Survey and the Geological Survey. Upon graduation he decided on a career as a cartographer rather than a medical career, and, at the time of his retirement, was assistant chief of the Special Maps Section of the USGS.

He was a member of the American Society of Civil Engineers, the Society of American Military Engineers, the Washington Society of Engineers, and the American Congress on Surveying and Mapping.

The venerable Virginia surveyor Joseph Berry, who was Fairfax County Surveyor for more than 60 years, remained active in his profession until he died at his home in Vienna, Va., on Sunday, June 22, 1958.

Born in Ash Grove, Va., 88 years ago, he was the son of Captain C. Owens and Mary Josephine Gunnell Berry and a descendant of a long line of surveyors on both sides of the family. His great-great-grandfather, Henry Gunnell, was a surveyor during Colonial times and served on the Fairfax County Committee of Safety with George Washington and George

Mason. Henry Gunnell's surveying compass which was made in 1710 by Goldsmith Chandlee of Winchester, England, and which had Gunnell's name engraved on its face, was exhibited at the ACSM 18th Annual Meeting through the courtesy of Joseph Berry.

Well known in northern Virginia for decades in the settlement of boundary disputes, he also laid out the town of Ivanhoe in southwest Virginia and surveyed the site for the Marine base at Quantico, Va. In addition to his professional reputation, Mr. Berry enjoyed respect in his community in business and civic affairs, having served as mayor and councilman of Vienna, on the road commission for Fairfax County, and on boards of public-utility, building, and financing institutions.

Clinton W. W. Abbott, Associate Bridge Engineer, Bridge Research Section, Division of Highways, California Department of Public Works, died at Sacramento, California, on March 17, 1958, after completing nearly 20 years of service for the State. During the construction of the Bay Bridge, Mr. Abbott served as chief of party in laying out control points for the intricate East Bay structures.

Arthur D. Kidder, well known nationally in surveying and mapping circles, passed away at his home in Terre Haute, Indiana, early in June at the age of 82.

Born in Terre Haute on March 26, 1876, Mr. Kidder received his engineering training at Rose Polytechnic Institute of that city and graduated as a civil engineer. Later he pursued a course of astronomy at Columbian College (now George Washington University) and the Naval Observatory in Washington, D. C., receiving the degree of Master of Science in Astronomy.

Mr. Kidder entered the service of the former General Land Office of the Department of the Interior on July 24, 1900, as an examiner of surveys. During a lifetime of work with that agency, he was called upon to undertake assignments of great importance and complexity.

In 1901 and 1903 Mr. Kidder, as astronomer and surveyor, was assigned to make the astronomical determinations of the intersection of the true 100th Meridian with Red River and to make astronomical observations and calculations and to project such true lines as were required to mark upon the ground the points of intersection of the 100th Meridian and the 103d Meridian of West Longitude with the Parallel of 36° 30′ N. Latitude; the point of intersection of the 103d Meridian of West Longitude with the 32d Parallel of Latitude; and the point of intersection of the 32d Parallel of Latitude with the Rio Grande River, all in connection with the investigation of the boundary lines between the State of Texas and the Territories of New Mexico and Oklahoma. This work was carried out in virgin territory in advance of any geodetic control; time signals were obtained by direct telegraphic wire from St. Louis.

His thorough study and grasp of technical matters led to his selection on two occasions by the Supreme Court of the United States as a Commissioner of the Court to establish or reestablish disputed boundaries of States. One of these appointments involved the survey of the Texas-Okalahoma boundary along Red River and followed his work of cooperation with the legal staff of the Department of Justice in preparing for the trial of the suit by development of physical evidence. In the second case he was appointed as Commissioner of the Court to resurvey the boundary between the States of Colorado and New Mexico, which he had investigated many years previously as an employee of the General Land Office.

In the field of scientific contribution, Mr. Kidder calculated and compiled the mathematical tables and formulas included in the Standard Field Tables and Trigonometric Formulas prepared for the use of the engineering staff of the General Land Office in 1910. These tables are now in the eighth edition, being widely used by engineers in practically all of the Federal agencies as well as those in private practice. Mr. Kidder also devised the Ephemeris of the Sun and Polaris, first published by the General Land Office in 1910 to meet the needs of the engineering staff in precise astronomical determinations of latitude and azimuth in the field work of that organization. This publication has been continued annually since that date and is extensively used throughout the Government Service and the surveying profession.

Mr. Kidder retired December 31, 1946, and since that time had conducted a consulting practice in cadastral engineering. Throughout his lifetime he was intensely interested in the advancement of the standards of cadastral engineering in all its phases. After his retirement he maintained a keen interest in the surveying courses of instruction offered at the universities and colleges throughout the Middlewest, making frequent appearances as a speaker at several of those schools and at the summer surveying camps.

In 1949 Mr. Kidder was awarded the honorary degree of Doctor of Engineering by his Alma Mater.

Willie Oliver Byrd, eminent in the fields of surveying, mapping, photogrammetry and geodesy, died July 6, 1958, at the age of 51. He was born at Augusta, Georgia, and received his degree from Georgia Institute of Technology in 1927. He then entered the employ of the Georgia State Highway Department, became assistant engineer in the Walton Flythe engineering firm of Georgia in 1929, a practicing civil engineer in Georgia in 1934, and county engineer in 1935. From 1936 to 1946 he served in the computing office of the Pacific Island Engineers in Guam. He returned to the Ohio State University Research Foundation in 1947, where he was a senior member of the staff of the Mapping and Charting Research Laboratory until 1953. He then joined Northrop Aircraft, Inc., as a specialist in research and development of reconnaissance systems.

Willie Byrd had a rare combination of genius, understanding, and good humor, which won for him the deep affection and admiration of a host of friends to whom his death has been a sad loss.

FOR SURVEY AND GEOPHYSICAL WORK
Vessels for Charter—Worldwide
Modern, air-conditioned, steel, diesel-powered craft, especially designed for surveying and geophysics.

State Boat Corporation
P. O. Box 543 **HOUSTON, TEXAS** Telephone MAdison 3-0340

Opportunity for
SENIOR CARTOGRAPHER or GEODETIC COMPUTER
To supervise field and office work for Highway Planning Survey mapping program

Starting salary $650 to $750 per month — Liberal vacation

Send full information to:
Director of Highways
Alaska Highway Division
1228 E. Seventh Avenue
Anchorage, Alaska

ES 130 SURVEY DEPTH-OMETER

For salvage, submarine survey and channel inspection . . . all-purpose. Completely portable, lightweight . . . four scale ranges 0/65 feet, 60/125 feet, 120/185 feet and 180/245 feet. Accuracy ± ½ of 1%. Operates on 6 or 12 volts DC or 115 volts AC. Single transducer. Base price **$1,175.**

UNDERWATER TV CAMERA
UTH 4

Completely portable 3-unit Closed Circuit TV specially designed for depths to 180 feet. Diver holds camera (approx. 4 lbs. submerged), relays continuous high definition picture to Monitor screen on boat or land. Complete with surface Control Unit. Approx. **$4,000.**

Brochures Mailed on Request • All Prices F.O.B. New York
Write for name and address of Dealer nearest you

BLUDWORTH MARINE
Division of KEARFOTT COMPANY Inc.
1500 Main Avenue, Clifton, N. J.

DOES CANADA LEAD THE U.S.A.?

During the past few years, many copies of **"RAPID TRAVERSE TABLES"** with its patented calculator have been purchased by surveyors and engineers in Canada.

"RAPID TRAVERSE TABLES", which was designed as a computing aid for surveyors, contains multiples of natural sines and cosines for every minute of angle, computed accurately to five decimal places.

Order your copy today from Leo Jean Goldsmith, 1363 Elevation Road, San Diego 10, California. Price: $5.00 per copy.

THE BRUNTON* POCKET TRANSIT

IT'S HANDY...
weighs only 9 oz.; 2¾" x 3" x 1⅛"; easy to carry in pocket, on belt, in car.

IT'S VERSATILE...
ideal for preliminary and supplementary surveying; used as a compass, transit, level, plumb, alidade, clinometer. Shows direction to 1°; level, slope or grade within 1°.

IT'S MADE TO LAST A LIFETIME
"Over 60,000 Brunton Transits since 1896"

See your local engineering supply house or WRITE FOR CATALOG

**Brunton is a registered trademark of*

WM. AINSWORTH & SONS, INC.
2151 LAWRENCE ST. • DENVER 5, COLORADO

NEW MEMBERS

INDIVIDUAL MEMBERSHIPS

ARCAND, Victor A., Paulding Route, Bruce Crossing, Mich.—Engineer, White Pine Copper Co.

ARMOUR, James M., 519 73rd Pl., N.E., Washington 27, D. C.—Cartographer, USN Hydrographic Office

ARNOLD, Allan E., Bureau of Land Management, Bldg., 50, Denver Federal Center, Denver, Colo.—Supervisory Cadastral Surveyor

ARNOLD, Claude W., Box 102, Fairhope, Ala.—Partner, Fairhope Title and Survey Co.

ASHELFORD, Allen D., 2420 N. 48th Terrace, Kansas City, Kans.—Draftsman-Surveyor, McKinnell & Buford

ATKINS, William H., 102 E. Main St., Edna, Tex.

BACON, Thomas R., 670-A 9th St., San Bernardino, Calif.—Office Manager, Maxwell Land Surveying

BAIN, Joe B., P. O. Box 386, Wharton, Tex.

BAIRD, Donald W., Box 244, Kingston, Ontario, Canada—Senior Inspector, Ontario Department of Highways

BALL, Francis X., 3423 Shardale Drive, Jackson, Mich.—Civil Engineer, Geo. E. Snyder Assoc., Inc.

BARKSDALE, John F., 305 Ozan Courts, Texarkana, Ark.

BARTHOLOMEW, Samuel K., Box 526, Curundu, Canal Zone—Cartographer, Inter American Geodetic Survey

BATEMAN, John A., 4339 Gertrude Ave., St. Louis 16, Mo.—Cartographer

BAUCH, G. David, P. O. Box 66, Farmington, Mo.—Land Surveyor

BEAN, Walter G., 1603 Armand St., East St. Louis, Ill.—Cartographer, A.C.I.C.

BENNETT, John H., 4603 Alcorn Drive, La Canada, Calif.—Assistant Civil Engineer, California Department of Water Resources

BERRY, Everette C., 2200 Missouri Ave., St. Louis 4, Mo.—Cartographer, A.C.I.C.

BERTOLAMI, M. J., 3295 Coolidge Hwy., Berkley, Mich.—Sumik Distributors, Inc.

BICKELHAUPT, Benjamin A., 113 Grace Ave., Cocoa, Fla.—Chief, Survey Party, Pan-American World Airways

BLODGETT, Eugene F., South St., Brattleboro, Vt., Geodesist, Army Map Service

BOND, Arthur W., Apt. 801, 1650 Dorchester St., W., Montreal 25, Quebec, Canada—Cartographer, I.C.A.O.

BONJOUR, D. E., 13416 W. 91st Terrace, Lenexa, Kans.—Civil Engineer, Corps of Engineers, U. S. Army

BOWMAN, Robert B., 3 Williams St., Salem, Mass.—Chief, Survey Party, Schofield Bros.

BOYD, Jay Bruce, 1616 NE 77th Ave., Portland 13, Oreg.—Engineer, Oregon State Hwy. Dept.

BRAMMER, Douglas H., 2864 Wainwright Road, Salt Lake City 9, Utah—Engineer

BRIAN, Lawrence G., 1526 Main St., Redwood City, Calif.—Civil Engineer

BRILL, Ralph, 70 Springdale Ave., Wheeling, W. Va.—Field Engineer, Pride Engineering Assn.

BRINTON, Miss Helen M., 6609 Washington St., University City, Mo.—Cartographer, A.C.I.C.

BRITTAIN, Captain John H., 8501 Rayburn Road, Bethesda 14, Md.—Chief, Division of Geodesy, Coast and Geodetic Survey

BRONCZYK, Edward John, 10710 St. Lawrence St., St. Ann, Mo.—Cartographer, A.C.I.C.

BROWN, Franklin B., 608 Sklar Bldg., Shreveport, La.—Manager, Franklin B. Brown & Associates

BUCCI, Dominick A., 400 Calvin Lane, Rockville, Md.—Asst. Chief, Operations Div., A.M.S.

BURR, Lillian, 6645-A Devonshire St., St. Louis 9, Mo.—Cartographer, A.C.I.C.

BURROUGHS, J. J. B., 321 Woodland Road, Washington 23, D. C.—Supervisory Cartographer, USN Hydrographic Office

BYRON, Arthur W., 5116 Logan St., Washington 28, D. C.—Cartographer, USN Hydrographic Office

CAMPBELL, Raymond W., 6223 Slater St., Merrian, Kans.—Owner, Raymond W. Campbell & Associates

CARTIER, Leonard, 9469 Lajeunesse St., Montreal 12, Quebec, Canada—Consulting Engineer, Cartier & Leclerc

CARTWRIGHT, Harvey A., 326 Plymouth Bldg., Minneapolis, Minn.—Surveyor, Cartwright and Olson

CASTER, Carles L., 9318 Veterans Drive, S. W. Tacoma 99, Wash.—Land Surveyor's Assistant and Draftsman

CHAMPAGNE, Richard H., P. O. Box 193, New Orleans 3, La.—Draftsman, Shell Oil Co.

CHASE, Harold J. L., 3620 St. Sebastian Lane, St. Ann, Mo.—Cartographer, A.C.I.C.

CHATELAIN, Edward P., 2055 Lafreniere St., New Orleans, La.

CHRISBACHER, Ernest, 25 Summit Ave., Hawthorne, N. J.—Associate Engineer, Earle W. Bailey, P. E.

CLARKE, Waldo H., P. O. Box 418, Sparta, N. J.—Land Surveyor

CLAUS, Prof. Roger J., Dept. of Civil Engineering, Bucknell University, Lewisburg, Pa.

COCKRELL, Joseph C., 3205 January Ave., Apt. 2, St. Louis 9, Mo.—Supervisory Cartographer, A.C.I.C.

CODDINGTON, Joseph E., 366 Lebanon School Road, Dravosburg, Pa.—Assistant Chief Engineer, New York State Natural Gas Corp.

COLES, Melvin W., 32 Anacostia Road, N. E., Washington 19, D. C.—Cartographer

COMFORT, Homer D., 935 Dickson St., Kirkwood 22, Mo.—Assistant to Superintendent, Milwhite Mud Sales Co.

COOL, Clifford C., P. O. Box 574, Midland, Tex.—Partner, Cool & Stilley, Consulting Engineers and Surveyors

COSGROVE, P. W., 279 McMillan St., Grosse Pointe Farms, Mich.—Surveyor, Municipal Consultant Service

COTTER, Firman R., 6324 Ashbury Drive, Affton 23, Mo.—Cartographer, A.C.I.C.

COUSLEY, J. B., Jr., 221 South Adams St., Lebanon, Mo.—City Engineer

CROSBY, John H., County Engineer, Duval County, Jacksonville 2, Fla.

CRUZ, Jerry A., 218 Equestrian Ave., Santa Barbara, Calif.—Draftsman, Ventura Co. Surveyors Office

DALY, Thomas I., Room 250, 537 Roy St., Seattle 9, Wash.—Drafting Supervisor, Standard Oil Co. of Calif.

DAVENPORT, Richard P., 9200 Seneca Lane, Overland 14, Mo.—Party Chief, The Sterling Surveying Co.

DAVIS, Harry P., 142½ Brevard Court, Charlotte, N. C.—Surveying & Mapping

DE BENEDICTY, George, 560 Howard Ave., Grimes Hill Manor, Staten Island 1, N. Y.—Surveyor

DOBBS, Calvin J., 519 Lee Ave., Festus, Mo.—Land Surveyor

DREIFUSS, Leonard L., 5442 MacBeth St., Hyattsville, Md.—Supervisory Cartographer, Coast and Geodetic Survey

DRISCOLL, Gilbert O., 1842 Silver Ave., San Francisco, Calif.—Cartographic Aid, Corps of Engineers, U. S. Army

DU BOSE, Walter R., 429 Third St., San Bernardino, Calif.—San Bernardino Blue Print Co.

DUNGAN, Fred C., 5043-A Chippewa Ave., St. Louis 9, Mo.—Cartographer, A.C.I.C.

DUNN, James M., Territorial Office Bldg., Honolulu 13, Hawaii—Surveyor, Territory of Hawaii

DZIWULSKI, Melvin M., The Instruments Corp., 4 N. Central Ave., Baltimore 2, Md.—Consulting Engineer

EAST, Toney, General Delivery, Fredericktown, Mo. —Lead Mining Surveyor

ELLS, William C., P. O. Box 670, El Monte, Calif.—Civil Engineer, Adams and Ells

ERWIN, Robert Blake, 2222 Murray St., Niagara Falls, Ontario, Canada—Ontario Land Surveyor and Engineer

EVANS, Charles L., 1121 14th St., Modesto, Calif.—Instrumentman, George S. Nolte, Consulting Engineers

EVANS, William W., Box 670, El Monte, Calif.—Vice President, Adams & Ells, Civil Engineers

EXLER, Mrs. Pat M., 424 Corona Ct., Webster Groves 19, Mo.—Cartographer, A.C.I.C.

FAGG, Kenneth S., Geo-Physical Maps, Inc., 48 W. 25th St., New York 1, N. Y.—Vice President and Art Director

FALCONER, George, Apt. 403, 268 Poplar Plains Road, Toronto, Ontario, Canada—Geographer, Geophysics Lab., University of Toronto

FANCHER, Charles T., 17603 Lenore St., Detroit 19, Mich.—Civil Engineer, Corps of Engineers, U. S. Army

FAUST, James K., R 519 N. Center St., Ebensburg, Pa.—Chief Draftsman, L. Robert Kimball, Consulting Engineer

FEHR, Ernest W., Jr., P. O. Box 1957, Boise, Idaho —President, Aerial Mapping Co.

FERRIS, Captain Schuyler D., 4418 No. 4 Road, Arlington 3, Va.—Cartographer, Army Map Service

FLEMING, James J., Box 748, Montrose, Colo.—Area Engineer

FLOHR, Daniel G., 308 Merchants Bank, Vicksburg, Miss.—Surveyor

FLOWERS, James S., Jr., P. O. Box 3366, Bellaire, Tex.

FLOYD, Ebert, Lake City, S. C.—Land Surveyor

FREY, Charles H., 125 Peeke Ave., Kirkwood, Mo.—Supervisory Physical Scientist, A.C.I.C.

GARRETT, Ben S., 206 Warwick Apts., New Orleans, La.

GEBHARDT, Neil H., 524 Westview St., Philadelphia, Pa.—Engineer, Aero Service Corp.

GEORGE, Captain Clarence A., Coast and Geodetic Survey, Washington 25, D. C.

GILLETTE, Elmo F., 2641 West Ave. 34, Los Angeles, Calif.—Sales Representative, Keuffel & Esser Co. of N. Y.

GILMORE, Commander Ross A., 315 Custom House, New Orleans, La.—New Orleans District Officer, Coast and Geodetic Survey

GONZALEZ, Adolph, 538 Dawnview, San Antonio 1, Tex.—Cartographer, Army Map Service

GOYAL, Om Parkash, 1116½ Oak St., Fort Wayne, Ind.

GRACIE, Gordon, 205 Surveying Bldg., University of Illinois, Urbana, Ill.—Instructor in Civil Engineering

GRENELL, Captain S. B., Coast and Geodetic Survey, Washington 25, D. C.—Chief, Division of Coastal Surveys

GREULICH, Gunther H., 36 Lexington St., W. Newton 65, Mass.—Civil Engineer, New England Survey Service

GROSS, Chester, 8309 Seville St., University City 14, Mo.—Cartographer, A.C.I.C.

GUDGELL, George, 240 South 2nd St., East, Salt Lake City, Utah—President, Bush and Gudgell, Inc.

GUERRERO, Kenneth E., 550 College Ave., Palo Alto, Calif.—Associate, Jones, Thenn & Associates

HALLER, Edward A., 6507 Walnut St., S. E., Washington 22, D. C.—Cartographer, USN Hydrographic Office

HANSON, Donald A., Aeronautical Chart and Information Center, 2nd and Arsenal Sts., St. Louis, Mo. —Cartographer

HARDIN, Darrell H., 5227 N. Hyacinth St., Azusa, Calif.—Assistant Engineer, State Division of Highways

HARWOOD, E. H., 415 Horace Mann Ave., Winston-Salem 5, N. C.

HATCHER, Harry E., Box 128, Neosho, Mo.—Harry E. Hatcher Co., Surveyors and Engineers

HAYWOOD, Frank William, 106 Summit Ave., Webster Groves 19, Mo.—Deputy Surveyor, Rowland Surveying Co.

HIROTA, Sam O., 718 University Ave., Honolulu 14, Hawaii—Civil Engineer, City and County of Honolulu

HOLT, Clarence F., 9023 Volta St., Lanham, Md.—Cartographer, USN Hydrographic Office

HOOVER, Harold E., 300 Wedge Drive, Ferguson 21, Mo.—Industrial Engineer, Wabash Railway

HORTSMANN, T. C., 921 Madison St., Jefferson City, Mo.—Civil Engineer and Surveyor

HOWARD, Thomas B., 1300 Calvert St., Baltimore 2, Md.—Maryland Surveying & Engineering Co.

HUEGEL, William M., 608 West Abert Place, Milwaukee 12, Wis.—Survey Crew Chief, Milwaukee Gas Light Co.

HUGHES, William R., 6512 Rutgers St., Houston, Tex.

JENSEN, Harold L., Jr., 748 E. Washington St., Hillsboro, Oreg.—Surveyor, City of Hillsboro

JOHNSON, Warren M., 3331 Centennial St., Littleton, Colo.—Cartographer, U. S. Geological Survey

JOHNSTON, Leonard B., Box 1576, Anchorage, Alaska—Rutledge, Johnston, and Tryck, Engineers and Surveyors

JONES, Charlie, Jr., 334 19th St., N.E., Washington, D. C.—Cartographer, USN Hydrographic Office

JONES, Robert B., 240 South, 2nd East St., Salt Lake City, Utah—Land Surveyor, Bush and Gudgell, Inc.

JOOSTEN, Rigdon E., 1030 Colebrook Drive, Webster Groves, Mo.—Cartographer, A.C.I.C.

KAROHL, Ernest L., 8 Jo Ann Place, Webster Groves, Mo.—Cartographer, A.C.I.C.

KEIM, John G., 5827 Era Ave., St. Louis 21, Mo.—Cartographer, A.C.I.C.

KEITH, Edward J., 4021 20th St., San Francisco, Calif.

KING, James D., 1430 E. Rancho Drive, Phoenix, Ariz.—Land Surveyor, Holmquist Engineers

KINGBURY, Robert C., Department of Geography, Indiana University, Bloomington, Ind.—Cartographer

KLUTE, Allan A., Aeronautical Chart and Information Center, 2nd and Arsenal Sts., St. Louis, Mo.—Cartographer, Chief, Projections Office

KRAUSE, Heinz B., 1154 Stratford Ave., Bronx 72, N. Y.—Surveyor, Knox & Garvin, Inc.

KROENINGER, Joseph S., 5404 S. 114th St., Hales Corners, Wis.—Surveyor, Milwaukee Gas Light Co.

LARKINS, Thomas H., 3347 Hadley Ave., Memphis 11, Tenn.—Civil Engineer, Corps of Engineers, U. S. Army

LARREO, Pablo, 424 Baker Tower, Ithaca, N. Y.—Student, Cornell University

LARSON, Clifford E., 1327 S. Olive St., Los Angeles, Calif.—Sales Representative

LARSON, Lorys J., 122 W. 7th St., Brookings, S. Dak. —Instructor in Civil Engineering, South Dakota State College

LAURIE, Billy D., 26950 Fisher St., Highland, Calif. —Locating Engineer, Highway Dept., County of San Bernardino

LAYOS, George J., 7040 W. Colfax St., Lakewood, Colo.—Cartographer, U. S. Geological Survey

LECOUNT, Miss Doris E., Box 525, Santa Barbara, Calif.—Senior Draftsman

LEONARDO, Earl S., Dept. 453-A, Goodyear Aircraft Corp., Litchfield Park, Ariz.—Development Engineer

LE SIEUR, Sidney W., 4371 W. 4835 S., Kearns, Utah —Highway Design Engineer and Land Surveyor

LESLIE, Leon S., Jr., 7755 Emerson Road, West Lanham Hills, Hyattsville, Md.—Surveyor, Potomac Electric Power Co.

LOCKE, G. W., Jr., 2010 Avenue N½, Huntsville, Tex.—Supervisor, Survey, Boundaries and Titles, Champion Paper and Fibre Co., Texas Division

LOVE, Frank W., 33 Norlong Blvd., Toronto 6, Ontario, Canada—Cartographer, Ontario Department of Mines

LOWDEN, Harley E., 733 Ridge Road, Redding, Calif. —Land Surveyor with Adams and Reiser, Engineering Consultants

LYMAN, Fred Henry, 3737 S. Broadway, St. Louis 18, Mo.—Engineer and Estimator, Kalicak Construction Co.

MACARTHUR, James Kenneth, 84 Fairlawn Ave, Toronto, Ontario, Canada—Land Surveyor, Ontario Dept. of Highways

MAGGIORE, William James, 1143 W. Brown Ave., Fresno 5, Calif.—Student, Fresno State College

MARCO, Prof. Herbert F., Dean of Engineering, South Dakota State College, College Station, Brookings, S. Dak.

MARINER, L. T., Box 3669, Terminal Annex, Los Angeles, Calif.—Principal Civil Engineer, Dept. of Water & Power, Los Angeles

MARSHALL, Thomas G., Box 31, Durham, Pa.—Engineer

MARTINEZ, Jesus, 1917 Ronda Drive, Los Angeles 32, Calif.—Civil Engineering Assistant, City of Los Angeles

MATSUO, Larry K., 34 S. Beretania St., Honolulu, T. H.—Surveyor, Park & Park, Inc.

McADAMS, George C., 6518 S.E. Division St., Portland, Oreg.—Surveyor, George McAdams & Associates

McCARTER, D. C., c/o Aerial Mapping Co., 1526 Vista Ave., Boise, Idaho—Civil Engineer

McCOY, Lloyd H., 7901 Navajoe St., Affton 23, Mo.—Cartographer, A.C.I.C.

McFARLAND, Maurice, 8637 Miller St., Buena Park, Calif.—Chief of Party, City of Alhambra

McGEORGE, Wm. W., 410 Times Bldg., Portland, Oreg.—Lawyer and Partner, Babcock and McGeorge

McKEON, Joseph A., U. S. Geological Survey, 1109 N. Highland St., Arlington 10, Va.—Cartographer, Topographic

McKINNEL, Fred B., City Engineer, 730 Armstrong Ave., Kansas City, Kans.

McLEOD, Don, Apartado 1488, Caracas, Venezuela, S. A.—Seismic Surveyor, Seismograph Service Corporation of Venezuela

McNABB, Wm. M., Box 31, Crane, Mo.—Engineer-Inspector, Missouri State Highway Dept.

McRAE, E. Hampton, 503 Midiron Way, Golf Club Estates, Melbourne, Fla.—Civil Engineer, Pan American World Airways, Inc.

MEACHAM, E. M., 4209 Quails Lane, Fort Worth, Tex.—Civil Engineer

MEIER, Albert, R.F.D. 1, Jo-Nel Park, Hudson, N. Y. —Land Surveyor and Civil Engineer

MENDENHALL, William W., Jr., Box 754, Fairbanks, Alaska—Owner, Mendenhall Aerial Surveys

MEREDITH, Cyril E., 2145 McCausland St., St. Louis 17, Mo.—Surveyor, Mississippi River Fuel Corp.

MERRICK, Thomas C., 1 Fifth Ave., Bay Shore, N. Y. —Engineer and Surveyor, Robert J. Bartley Associates

MEYERS, Marvin E., U. S. Geological Survey, 1109 N. Highland St., Arlington, Va.—Cartographer

MIKELS, John V., Resident Engineers Office, Texas State Highway Dept., Pharr, Tex.—Senior Assistant Engineer, Texas State Highway Dept.

MILANO, Albert A., 4931 Milano Way, Martinez, Calif.—Civil Engineer Assistant, Contra Costa County

MILLARD, R. E., P. O. Box 337, Liverpool, Nova Scotia, Canada—Superintendent of Streets, Town of Liverpool

MILLER, Charles F., R.F.D. 5, Towanda, Pa.—Project Engineer, American LaFrance Corporation

MILLER, William C., 106 8th St., N.E., Washington 2, D. C.—Supervisory Cartographer, USN Hydrographic Office

MIRTO, Anthony A., 103 Tudor St., Waterbury, Conn. —Assistant City Planner, City of Waterbury

MITCHELL, W. C., 1010 Waugh Drive, Houston, Tex.

MOORE, Guy T., 69 Forest St., Methuen, Mass.—Survey Party Chief, New England Survey Services

MOORE, Richard H., P. O. Box 328, Asheboro, N. C. —Civil Engineer, Moore, Gardner & Associates, Inc.

MORAN, John B., 4024-A Arsenal St., St. Louis 16, Mo.—Cartographer, A.C.I.C.

MORRISON, Mrs. M. B., 6288 Allentown Road, S. E., Washington 22, D. C.—Cartographer, USN Hydrographic Office

MUCKLESTONE, Raymond Frank, Box 121, Brockville, Ontario, Canada—Surveyor and Engineer

MUCKLEY, Robert V., 1650 Tuscarawas St., W., Canton, Ohio—Civil Engineer and Surveyor

MULDER, John R., 2400 S. Quitman St., Denver, Colo.—Cartographer, U. S. Geological Survey

MYERS, Lloyd Nelson, 184 Queen St., St. Catherines, Ontario, Canada—Land Surveyor

NELSON, Harvey F., R.F.D. 2, Box 49, Sandpoint, Idaho—Land Surveyor and Forester

NUNN, William R., Jr., 1201 S. Barton St., Arlington, Va.—Deputy Director, Air Navigation Division, USN Hydrographic Office

NUTE, J. Warren, 411 Fourth St., San Rafael, Calif. —Civil Engineer

NYMAN, Nels J., 1229 Second North St., Vicksburg, Miss.—Illustrator, Geological Mapping and Cartography

ODANO, Toshio, 20614 Sicouras Drive, Canoga Park, Calif.—Head Cartographer, System Development Corp.

OFFER, William Neil, 107 Redpath Ave., Apt. 201, Toronto 7, Ontario, Canada—Ontario Land Surveyor

OLINGER, John W., R.F.D. 4, Springfield, Ill.—Party Chief, Crawford, Murphy & Tilly

OLIVER, James W., 1405 Clermont St., Greensboro, N. C.—Engineer, Greensboro Public Works Dept.

OLSON, Leslie V., P. O. Box 1007, Downey, Calif.—President, Olson Surveying Service, Inc.

O'NEAL, William R., 7811 Carondolet St., Clayton, Mo.—Crew Chief, Rapp & Rapp, Surveyors

OPHEIM, Lee A., Box 496 Arsenal Sta., St. Louis 18, Mo.—Cartographer, A.C.I.C.

PALMER, Rex W., 1460 Oliver Ave., Oroville, Calif. —Civil Engineer Associate, California Dept. Water Resources

PARIS, Fred E., 221 Herbert St., Alton, Ill.—Superintendent Pictorial Relief Unit

PARTEGYL, Gilbert, 1426 Coolidge Drive, St. Louis 14, Mo.—Cartographer, A.C.I.C.

PAXTON, John E., Jr., 6410 Clearfield St., Box 205, Rutherford Heights, Pa.—Surveyor and Engineer, Gannett, Fleming, Corddry & Carpenter, Inc.

PEARCE, Leo J., 6024 Brookside Blvd., Kansas City, Mo.—Civil Engineer and Land Surveyor

PECKHAM, L. G., Jr., 6220 Julian St., St. Louis 14, Mo.—Cartographer, A.C.I.C.

PELTASON, Walter, 4913 Cordell Ave., Bethesda, Md.—Manager, U. S. Branch Office, Askania-Werke

PERSINGER, Charles R., Box 52, Boonville, Mo.—Land Surveyor

PETERSON, Gerald L., U. S. Geological Survey, Box 133, Rolla, Mo.—Cartographer

PHARMER, William D., 1209 Northampton St., Holyoke, Mass.—Engineer and Surveyor, Holyoke Water Power Co.

PHILLIPS, J. O., 8216 Hartford St., Houston, Tex.

PISULA, Casimir J., 5403 Hawthorne Place, N. W., Washington 16, D. C.—Cartographer, Army Map Service

PITTMAN, Gerald F., Bureau of Land Management, Bldg. 50, Denver Federal Center, Denver, Colo.—Cadastral Survey Aid, Bureau of Land Management

POTTS, Leonard A., 716 McKinney Ave., Houston, Tex.

PROSKIE, Charles A., 14 Searing Ave., Morristown, N. J.—Land Surveyor

RAGUSE, Earl G., 11930 W. Olympic Blvd., Los Angeles 64, Calif.—Assistant Chief Engineer, Benson-Lehner Corp.

REDDING, A. M., 4110 Lanark Lane, Houston 25, Tex.—Surveyor, Petty Geophysical Engineering Co.

REED, Edward A., Jr., 3256 Michigan Ave., St. Louis 13, Mo.—Cartographer, A.C.I.C.

REESE, Harlan W., 5251 Bancroft St., St. Louis 9, Mo.—Cartographer, A.C.I.C.

RENDO, William C., 9707 Wendell Drive, St. Louis 21, Mo.—Cartographer, A.C.I.C.

REYNOLDS, Vernon J., 2137 S. 10th East, Salt Lake City, Utah—Surveyor, Academy Engineering Corp.

RICAURTE, Victor, Correra FN°1F-01, Bogata D. E., Colombia, S. A.—Engineer, International Petroleum, Ltd.

RICHMOND, Lafayette E., Box 6418, Washington, D. C.—Cartographer, A.C.I.C.

RIGGS, William A., 104 St. Francis St., Mobile, Ala. —Industrial Engineer, Gulf, Mobile & Ohio R. R.

ROSSLER, M. K., P. O. Box 1700, Houston, Tex.

ROWE, Donald M., 514 W. Woodbine Ave., Kirkwood, Mo.—Cartographer

ROWE, Robert D., I.A.G.S., Fort Clayton, Canal Zone —Cartographer, I.A.G.S.

RUTTINGER, Albert M., 5500 Maple St., Mission, Kans.—Engineer, Howard, Needles, Tammen and Bergen

SADDLER, Thomas C., 4120 Ashland St., St. Louis 15, Mo.—Cartographer, A.C.I.C.

SALIBA, Jim D., 3001 Geyer St., St. Louis 4, Mo.— Cartographer, A.C.I.C.

SANDERSON, Charles T., III, 136 Westerly Road, Plymouth, Mass.—Chief of Party, Delano & Keith

SAWYER, Robert P., P. O. Box 3366, Bellaire, Tex.

SCARBOROUGH, Ralph L., Marshfield, Mo.—Engineer, Sho-Me Power Corporation

SCHMIDT, Arthur R., 5526 N. Sayre Ave., Chicago 31, Ill.—Field Chief, Chicago Aerial Industries

SCHMINKE, Victor E., II, 124 Clyde Ave., Baltimore 27, Md.—Chief of Survey Party, Bureau of Highways

SCHOENEMAN, Frank A., 506 West 63rd St., Chicago, Ill.—Land Surveyor and Civil Engineer

SCHULER, Loren D., Box 133, Rolla Mo.—Cartographer, U. S. Geological Survey

SCOFIELD, Myrl Ralph, 9 W. 109th St., Kansas City Mo.—Surveyor, J. C. Nichols Co.

SCOTT, Harry M., 8020 Nannestad St., S. San Gabriel, Calif.—Surveyor and Office Engineer, Adams and Ellis

SCOTT–SMITH, L. T., 59 Robinwood Road, Waterbury 8, Conn.—City Plan Engineer

SEABROOK, E. M., Jr., 666 Bank St., Mt. Pleasant, S. C.—Civil Engineer and Land Surveyor

SEIDL, Alexander, 432 Boynton Ave., Berkeley 7, Calif.—Engineer, Pacific Gas & Electric Co.

SLATER, Lawrence W., Yuma, Mich.—Survey Supervisor, Michigan State Highway Dept.

SMITH, Kenneth H., 4717 Hudson Ave., S.E., Washington, D. C.—Cartographer, USN Hydrographic Office

SMITH, Robert L., 544 Summit Ave., Webster Groves, Mo.—Inspector, Missouri State Highway Dept.

SPOONER, C. S., Jr., R.F.D. 4, Box 499, McLean, Va. —Scientific Administrator, Army Map Service

SPRATFORD, Warren, 1538 35th St., Sacramento, Calif.—Surveyor, Beaches and Parks, State of California

STEINMANN, Donald H., 6 St. Celeste St., Florissant, Mo.—Cartographer, A.C.I.C.

STEWART, Alexander G., 14003 101st Ave., Edmonton, Alberta, Canada—Manager, Stewart, Weir & Stewart

STIRLING, Robert C., 7203 Holly Ave., Takoma Park, Md.—Supervisory Cartographer, USN Hydrographic Office

STROBACK, Gilbert R., 7324 Marwinette St., St. Louis, Mo.—Cartographer

SUMMERS, Leerie R., 502 S. Old Orchard St., Webster Groves 19, Mo.—Cartographer, A.C.I.C.

SWANSON, Ernest R., 3862 Lafayette Ave., St. Louis 10, Mo.—Cartographer, A.C.I.C.

TALLETT, James F., Jr., 3123 Roosevelt St., Clinton, Iowa—Engineering Staff, City of Clinton, Iowa

TAYLOR, George H., Jr., P. O. Box 1700, Houston, Tex.

TAYLOR, John H., 2924 S. Grand Blvd., St. Louis, Mo.—Cartographer, A.C.I.C.

TAYLOR, Mildred Irene, 2nd & Arsenal Sts., St. Louis, Mo.—Cartographer, A.C.I.C.

TEUNISSON, John H., 1285 Kirk Circle, Greenville, Miss.—City Engineer, City of Greenville

THACHER, Elwood J., 128 North Wakefield St., Arlington 3, Va.—Chief, Plans Unit, Atlantic Region, U. S. Geological Survey

THOMPSON, Theodore S., 1246 University Ave., St. Paul 4, Minn.—Engineer, Minnesota Dept. of Highways

TILLERY, Arthur L., 6009 Reed St., N. Englewood, Md.—Cartographer, USN Hydrographic Office

TRAIN, Timothy S., 3260 J St., Sacramento 16, Calif. —Surveyor, Packard, Muir & Train, Inc.

TROUTMAN, Edward C., 2338 Carisle Road, York, Pa.—Topographer, Buchart Engineering Corp.

UHARRIET, John M., 642 Lemon Ave., Arcadia, Calif.—Chief of Surveying Party, Los Angeles County

VAN CLEVE, William G., Jr., 117 Jefferson St., St. Charles, Mo.—Van Cleve Surveying Co.

VOELKER, Edward D., Jr., 4165 St. George Place, Riverside, Calif.—Survey Party Chief, City of Riverside

WALKER, Albert L., 312 Wadsworth Hall, Houghton, Mich.—Student, Michigan College of Mining & Technology

WALKER, Mrs. Dorothy F., 4450-A West Belle St., St. Louis 8, Mo.—Cartographer

WALTER, Russell F., 5721 College Ave., Oakland, Calif.—Party Chief, Corps of Engineers, U. S. Army

WARD, Thomas B., Jr., 233 Martin St., Uvalde, Tex. Surveyor, Medina Electric Cooperative, Inc.

WEBSTER, Wallace L., 37 Florida Ave., N.W., Washington 1, D. C.—Cartographer, USN Hydrographic Office

WEENE, Stewart H., 1020 19th St., Washington 6, D. C.—Cartographer, USN Hydrographic Office

WENGERT, Frank D., 146 W. Chestnut Ave., San Gabriel, Calif.—Assistant Engineer, Union Pacific R. R.

WHISNANT, Lloyd T., Jr., 10113 Hammerdale Lane, Affton, Mo.—Cartographer, A.C.I.C.

WHITLOCK, Allan M., 1919 Richard St., Burbank, Calif.—Land Surveyor

WILDMAN, William Neil, 2238 Pineneedle Row, Erindale, Ontario, Canada—Supervisor, Marshall, Macklin, & Monaghan, Ontario Land Surveyors

WILLIS, George A., 1511 Vassar St., Houston 6, Tex.

WINDHAM, Jack E., P. O. Box 2180, Houston, Tex.

WOOD, William D., Department of Geography, University of Illinois, 220 Davenport Hall, Champaign, Ill.—Graduate Student, University of Illinois

WORCHEL, Stanley N., U. S. Geological Survey, 1109 North Highland St., Arlington 10, Va.—Cartographer, Topographic Division, Atlantic Region

YAHL, Maurice H., Box 1745, R.F.D. 8, Mehlville, Mo.—Cartographer, A.C.I.C.

YOUNG, Hayden J., 616 8th St., Highland, Ill.— Cartographer, A.C.I.C.

YOUNG, James Edward, P. O. Box 1700, Houston, Tex.

YOUNG, Captain Joseph M., Jr., USAF, 20 Jane St., New York 14, N. Y.

ZIELASKO, Robert H., 800 Cadillac Square Bldg., Detroit 26, Mich.—Chief Draftsman, Detroit Regional Planning Commission

LIBRARY MEMBERSHIPS

UNIVERSITY OF VERMONT, Burlington, Vermont

UNIVERSITY COLLEGE OF GHANA, P. O. Box 4, Achimota, Ghana

UNIVERSITY OF SAN CARLOS, Cebu City, Philippines

CONGRESS DIRECTORY

EXECUTIVE OFFICERS

PRESIDENT: W. B. Williams, 238 Ottawa Ave., N.W., Grand Rapids 2, Mich.

VICE PRESIDENT: George C. Bestor, P. O. Box 3045, Carmel, Calif.

EXECUTIVE SECRETARY: Walter S. Dix, 435 Woodward Bldg., c/o TVA, Washington 5, D. C.

TREASURER: Capt. H. W. Hemple, c/o American Congress on Surveying and Mapping, 905 Washington Bldg., 1435 G St., N.W., Washington 5, D. C.

EDITOR: Howard S. Rappleye, 6712 Fourth St., N.W., Washington 12, D. C.

STANDING COMMITTEE CHAIRMEN

BUDGET: John M. Amstadt, 5350 2nd St. North, Arlington, Va.

CONSTITUTION: Walter S. Dix (Acting), 435 Woodward Bldg., c/o TVA, Washington 5, D. C.

MEMBERSHIP: Capt. Frank S. Borden, 905 Washington Bldg., 1435 G St., N.W., Washington 5, D. C.

PROFESSIONAL STATUS: Sol A. Bauer, 1836 Euclid Ave., Cleveland 15, Ohio

PUBLIC RELATIONS: Helmuth Bay, 1104 National Press Bldg., Washington 4, D. C.

PUBLICATIONS: Charles A. Whitten, Coast and Geodetic Survey, Washington 25, D. C.

DIVISION CHAIRMEN

CARTOGRAPHY: Granville K. Emminizer, Room 3800 U. S. Coast and Geodetic Survey, Washington 25, D. C.

CONTROL SURVEYS: Lansing G. Simmons, Room 2120 U. S. Coast and Geodetic Survey, Washington 25, D. C.

EDUCATION: Prof. Leo V. Nothstine, Civil Engineering Department, Michigan State College, East Lansing, Mich.

INSTRUMENTS: Clifford A. Thorpe, Jr., 501 Woodlawn Ave., Falls Church, Va.

PROPERTY SURVEYS: A. Phillips Bill, 289 Main St., South Deerfield, Mass.

TOPOGRAPHY: Page F. Hopkins, 8506 Dixon Ave., Silver Spring, Md.

LOCAL SECTION OFFICERS

COLORADO: Emmett J. Coon, *Chairman,* Topographic Division, U. S. G. S., Bldg. 25, Federal Center, Denver 2, Colo.
Lester W. Ganahl, *Secretary-Treasurer,* Topographic Division, U. S. G. S., Bldg. 25, Federal Center, Denver 2, Colo.

GREAT LAKES: Prof. Kenneth L. Curtis, *Chairman,* Civil Engineering Dept., Purdue University, Lafayette, Ind.
Dr. George E. Ekblaw, *Secretary,* 216 Natural Resources Bldg., Urbana, Ill.

LOUISIANA: C. E. Bridges, *Chairman,* P. O. Box 231, Houma, La.
H. G. Snead, *Secretary,* P. O. Drawer 37, Harvey, La.

NORTH CAROLINA: Benjamin E. Kirkman, *Chairman,* Duke Power Co., Charlotte, N. C.
W. Thompson Cox, *Secretary,* P. O. Box 178, Gastonia, N. C.

NORTHERN CALIFORNIA: Charles O. Greenwood, Jr., *Chairman,* 2321 21st St., Sacramento, Calif.
William A. White, *Secretary,* 5505 Eighth Ave., Sacramento, Calif.

SOUTHERN CALIFORNIA: Harvey E. Rookus, *Chairman,* Richfield Oil Corp., 5900 Cherry Ave., Long Beach, Calif.
Reynold L. Pedersen, *Secretary,* General Petroleum Corp., 10737 South Shoemaker Rd., Santa Fe Springs, Calif.

TEXAS: Leonard E. Cornitius, *Chairman,* Houston Lighting & Power Co., P. O. Box 1700, Houston 1, Texas
Glenn E. Musselman, *Secretary,* The Texas Company, P. O. Box 2332, Houston, Texas.

IT IS NOT TOO EARLY TO BEGIN PLANNING TO ATTEND THE 1959 MEETINGS

SUSTAINING MEMBERS

ABRAMS INDUSTRIES, (Abrams Aerial Survey Corp., Abrams Instrument Co.), Lansing, Mich.

AERO SERVICE CORP., 236 East Courtland St., Philadelphia, Pa.

BERG, HEDSTROM & CO., INC., 1170 Broadway, New York 1, N. Y.

C. L. BERGER & SONS, INC., 37 Williams St., Boston, Mass.

EUGENE DIETZGEN CO., Chicago—New York—San Francisco—New Orleans

FILOTECNICA SALMOIRAGHI S.P.A. OF MILAN, represented by Filotecnica Salmoiraghi, Inc., 4114 24th St., Long Island City 1, N. Y.

GEO OPTIC CO., 170 Broadway, New York 38, N. Y.

GRANT PHOTO PRODUCTS, INC. (Formerly Grant Positype Corporation of America), 18915 Detroit Ave., Cleveland, Ohio.

W. & L. E. GURLEY (4 Memberships), Troy, N. Y.

HILGER & WATTS, LTD., London, England; represented by Eugene Dietzgen Co., and Engis Equipment Co., Chicago, Ill.

INTERNATIONAL AERIAL MAPPING CO., 127 Air-Port Blvd., San Antonio 12, Tex.

KERN & CO., LTD., Aarau, Switzerland; represented by Kern Instruments Inc., 120 Grand St., White Plains, N. Y.

KEUFFEL & ESSER CO., Adams & Third Sts., Hoboken, N. J.

GEO. F. MUTH CO., INC., 1332 New York Avenue, N.W., Washington 5, D. C.

PAFFORD & ASSOCIATES, 1908 West Beverly Blvd., Los Angeles 57, Calif.

RAND MCNALLY & CO., (2 Memberships), Chicago, Ill.

REED RESEARCH INC., 1048 Potomac St., N.W., Washington 7, D. C.

W. J. ROBBINS & CO., 885 N. LaSalle St., Chicago 10, Ill.

R. M. TOWILL CORP., LTD., 233 Merchant St., Honolulu 13, Hawaii

WILD HEERBRUGG INSTRUMENTS, INC., Main and Covert Sts., Port Washington, N. Y.

ZEISS-AEROTOPOGRAPH, Munich, Germany; represented by Transmares Corporation, 15 William St., New York 5, N. Y., and 2304 Wilson Blvd., Arlington, Va.

New Charting Program to Aid Small Boat Owners

The beginning of a research and development program which will lead to the design and ultimate production of a new series of small-size charts has been announced by the Coast and Geodetic Survey. More than 7,000,000 small-boat owners will be benefited by the new series of specially designed nautical charts for small-boat navigation. The cramped quarters available in small boats do not accommodate the large nautical charts now in use. Yachtsmen and small-boat operators will be provided navigation information in convenient form to insure safety and full use of the waterways by this new charting service.

Operators of the vast fleet of small boats using harbors, navigable rivers, and other inland or protected waters have felt an increasing need for a specially designed chart to meet their needs. The new series will be generously supplied with supplemental descriptive details heretofore found only in the Coast Pilots published by the Bureau.

The area selected for the experimental edition is the Potomac River from Washington, D.C., to its mouth, a distance of about 95 miles.

In order that the best possible chart can be developed, the Coast and Geodetic Survey is seeking advice and suggestions from potential users of the charts. Various sizes and formats have been suggested for the new series. Some suggestions call for chart sizes ranging from standard page size up to 17 by 26 inches. The Bureau wishes to learn what size would be most acceptable. Chart scale and portrayal of hydrographic and shore detail are also of primary importance in designing the new charts.

Also solicited are suggestions as to the type of descriptive information that should be included with the charts. Should this information be printed on the back or should it be included as separate pages? Should the chart and pilot information be folded, issued as a portfolio, or in packet form?

Any suggestions regarding the new charts should be sent to the Director, Coast and Geodetic Survey, Washington 25, D.C.

APPLICATION FOR MEMBERSHIP

I am interested in surveying and mapping and hereby apply for membership in the American Congress on Surveying and Mapping. I enclose $5.00 (U. S. and Possessions), $6.00 (Foreign) in payment of annual dues.

Name (Please type or print) .....

.....

Mailing Address .....

.....

Occupation and Organization .....

.....

Branches of surveying and mapping preferred .....

.....

Reference. If registered, please indicate .....

.....

Applicant's Signature ..... Date .....

(Send to: Chairman, Membership Committee,
905 Washington Bldg., 1435 G St., N.W., Washington 5, D. C.)

Reprints of Articles

Reprints in quantities of 50 or more may be obtained of any article appearing in this issue. Orders must be placed with the Editor-in-Chief, Howard S. Rappleye, 6712 4th St., N.W., Washington 12, D. C., not later than 3 weeks after publication. Authors who wish reprints of their articles may so indicate when manuscripts are submitted. Approximate prices of reprints follow:

	Without Covers						
Number	*4 pp.*	*8 pp.*	*12 pp.*	*16 pp.*	*20 pp.*	*24 pp.*	*Covers**
50	$13.25	$21.50	$32.00	$34.00	$44.50	$52.75	$10.50
100	$13.75	$22.50	$33.50	$35.50	$46.50	$55.25	$12.50
Add'l 100s	$ 1.10	$ 1.90	$ 2.90	$ 2.90	$ 4.00	$ 4.90	$ 4.10

* Heavy paper covers—over and above the cost of reprints without covers.

STABILENE FILM

TRADE MARK

for making maps by the superior system of *SCRIBING*

The U. S. Government has pioneered in recent years in making multicolor maps by the revolutionary scribing process. For this greatly improved system K&E has developed STABILENE FILM, a product as superior for the purpose as is the new system itself.

A film with extreme dimensional stability, STABILENE FILM offers these definite advantages:

1. It has very high transparency.
2. It is free from fibers. This gives it a smoother drawing surface. There can be no background of fiber pattern on reproductions made from the film.
3. It is flexible and can be handled freely.
4. It has high initial tear strength.
5. It is economical in cost.

Already, STABILENE FILM has found wide use in map making by private as well as public organizations. It is available with either a translucent surface for pencil and ink drawing, or with scribe coat for scribing, also sensitized for making reproductions. Scribe coat permits scribing of fine, sharp, clean lines without chipping at intersections or edges. For further information about this great advance in map making, write Keuffel & Esser Co.

KEUFFEL & ESSER CO.

New York • Hoboken, N. J.
Detroit • Chicago • St. Louis • Dallas • San Francisco
Los Angeles • Seattle • Montreal

THIS ALL-PURPOSE SELF-LEVELING LEVEL

Cuts Your Time in Half!

The ZEISS Ni2 Self-Leveling Level

This amazing new instrument cuts leveling time and costs in half. It sets a line of sight precisely level *automatically.* A remarkable new invention, the Compensator, built into the telescope levels the line of sight for you in a matter of moments. It performs any kind of leveling, from rough cross sectioning to first order work. Bench-mark leveling, using two rods, is almost twice as fast with the Ni2 as with an ordinary level. Cross-sectioning with many sights from one set-up is even faster. Accurate up to ±0.02 ft. per mile, the Ni2 is as rugged as its appearance suggests.

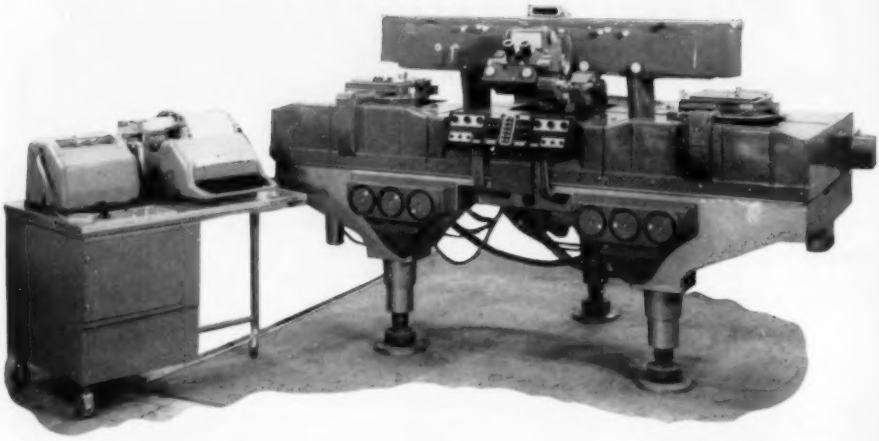
Drafting, Reproduction and Surveying Equipment and Materials, Slide Rules, Measuring Tapes.

KEUFFEL & ESSER CO.
EST. 1867
New York • Hoboken, N. J.

Detroit • Chicago • St. Louis • Dallas
San Francisco • Los Angeles • Seattle • Montreal

NISTRI
OMI
ROMA

Pioneering in Photogrammetric Instrumentation Since 1924



NISTRI STEREOCOMPARATOR TA-3

We take great pleasure in announcing that the newest and most advanced concept in precision stereophotogrammetric instrumentation is now being delivered.

Your inquiries are requested

OMI CORPORATION OF AMERICA

ENGINEERING and SALES OFFICES
512 North Pitt Street, Alexandria, Virginia
Telephone—KIng 9-4064

EXECUTIVE OFFICES
286 Fifth Avenue, New York 1, N. Y.
Telephone—OXford 5-1344

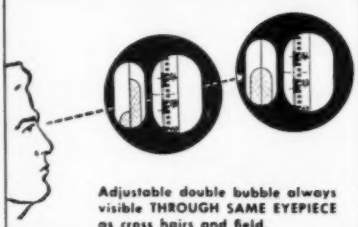
OTTICO MECCANICA ITALIANA e Rilevamenti Aerofotogrammetrici s.p.a. Via Della Vasca Navale 81 (Roma)

SURVEYORS!

Save time

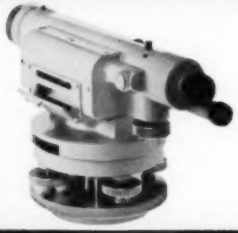
Save money

NEW LEVEL with



Adjustable double bubble always visible THROUGH SAME EYEPIECE as cross hairs and field.

DOUBLE BUBBLE



is "MISTAKE FREE"

- No need to turn telescope during leveling up
- American type—erecting eyepiece, 4 leveling screws
- Unbelievably fast and accurate, yet simple-to-use. Economical!

Mail this coupon for details

FENNEL

Instrument Corp. of America
45-22 Pearson St., Long Island City 1, N. Y.

MEETINGS

PAST, PRESENT, AND FUTURE

The Second Annual Meeting of the Missouri Association of Registered Land Surveyors is scheduled for Saturday, October 4, 1958, at Rolla, Mo.

The 1959 ASP-ACSM Convention and Co-Exhibit will be held March 8–14, 1959, at the Shoreham Hotel, Washington, D. C.

The 125th meeting of the American Association for the Advancement of Science, the seventh such meeting to be held in Washington, D.C., is scheduled for December 26–31, 1958.

MAP MOUNTING
MAP STANDS
MAP CASES

CARTOCRAFT
Map Display Rail
and Fixtures

Largest map and chart clothbacking facilities in the U.S.A. Write Dept. MM

DENOYER-GEPPERT CO.
5257 Ravenswood Ave., Chicago 40

NEW REMINGTON RAND REPORT

A new 30-page illustrated report, descriptive of the many engineering techniques which may be accomplished at extremely high speeds, covers the use of the Remington Rand Univac 120 and particularly its application to highway-survey computations. This report may be obtained by writing Remington Rand Univac, Division of Sperry Rand Corporation, 315 Fourth Ave., New York 10, N. Y.

AUTOCOLLIMATION EYEPIECE

An autocollimation eyepiece, which may be attached to their DKM2 one-second theodolite for use in precise alignment work, has been announced by Kern & Co. The new eyepiece does not have to be replaced for ordinary surveys, but once it is in place the telescope will "transit" only when the objective end goes "down and under." Further information may be obtained from Kern Instruments Inc., 120 Grand St., White Plains, N. Y.

1959 ASP & ACSM
Consecutive Meetings and Co-Exhibits

ASP Twenty-fifth Annual Meeting—March 8, 9, 10, 11
ACSM Nineteenth Annual Meeting—March 11, 12, 13, 14

REMEMBER ! !

Don't Forget March 8–14, 1959

It is not too early to start making your plans to attend the annual consecutive meetings of the American Society of Photogrammetery and the American Congress on Surveying and Mapping.

Where ? ? — At the Shoreham Hotel, Washington, D. C.

The 1959 convention promises to be one of the biggest and most interesting ever held.

You will be in for a surprise when you walk into the Exhibit Hall. Ray Mays, Chairman of the Exhibits Committee, is planning to make the 1959 exhibit one that you will never forget.

Make your plans to attend—NOW ! !

J. T. Pilonero, *Chairman*
1959 ASP–ACSM Publicity Committee

Notice—to ACSM Members and Officers:

ACSM Nineteenth Annual Meeting opens midweek of the above convention and runs through Wednesday, Thursday, and Friday, with required committee and executive sessions possibly extending through Saturday morning. This is similar sequence to the Seventeenth Annual Meeting in 1957 and in reverse to last year's meeting, when ACSM started first. ACSM starts after the ASP 25th Annual Meeting this time. Dates for the ACSM 19th Annual Meeting are March 11, 12, 13, 1959. Divisions can summarize convention developments in Thursday- or Friday-morning sessions in time for presentation to the ACSM Annual Business Meeting closing the Friday afternoon program.

Please make your plans and shape your programs accordingly.

Captain John H. Brittain, *Chairman*
ACSM Nineteenth Annual Meeting
Walter S. Dix
Executive Secretary, ACSM

GIANT for its size

Giant for work, speed-king for set-up and reading, ingenious for ease of operation . . . and as tough as they come for rugged field conditions.

In surprising and welcome contrast to full size performance is its neat, compact size: just 4½ x 6″ overall.

With tilting screw and prismatic tubular level, at a price much lower than you would expect, the Wild N-10 deserves your consideration.

Write for Booklet N-10

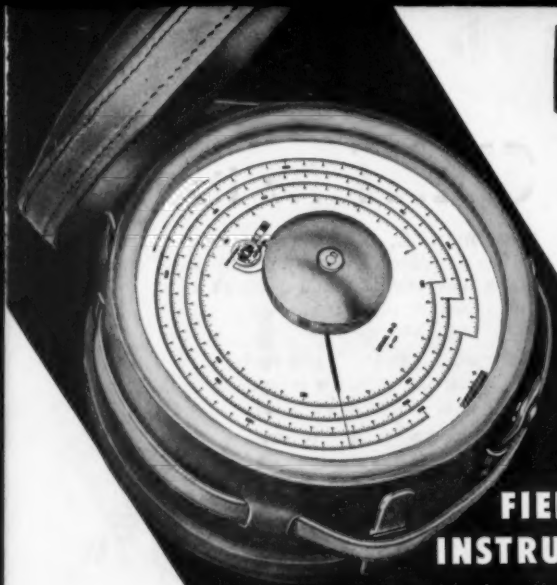
N-10 SURVEYOR'S LEVEL

WILD HEERBRUGG INSTRUMENTS, inc.

Main at Covert Streets · Port Washington, N. Y. POrt Washington 7-4843

SALES • FULL FACTORY SERVICES

MODERN ALTIMETER SURVEYS



FIELD INSTRUMENT

AMERICAN PAULIN SYSTEM

MICRO
SURVEYING ALTIMETER

Intervals as close as ONE FOOT

Models available in all ranges.

ENGLISH or METRIC.

Designed for rugged field use under all climatic conditions.

Price in U.S.A.
MICRO MODELS $300
TERRA MODELS $250

WRITE FOR DESCRIPTIVE CATALOG

BETTER ALTIMETER SURVEYS AT LOWER COST

MICRO SURVEYING BAROGRAPH

- CHART READING IMMEDIATELY AVAILABLE
- ACCURATE, SENSITIVE, (Same as our Micro Altimeter)
- EASILY READ
- DEPENDABLE
- LIGHT WEIGHT — EASILY PORTABLE

PRICE IN U.S.A.: $790 complete READY FOR USE

MADE IN U.S.A.

BASE INSTRUMENT RECORDER

MODEL SMB-5

PRECISION RECORDER REPLACES BASE OPERATOR

AMERICAN PAULIN SYSTEM

1524 SOUTH FLOWER STREET • LOS ANGELES 15, CALIFORNIA, U.S.A.

THE WORLD'S LEADING MANUFACTURER OF SURVEYING ALTIMETERS

N

ER

YS

TEM

AETER

E FOOT

ranges.

METRIC.

rugged

nder all

nditions.

S.A.

ELS $300

ELS $250

MADE IN
U.S.A.